FOREST STEWARDSHIP

Economic Benefits of Managing Forestry and Tourism at Nimmo Bay

A Public Perception Study and Economic Analysis

DOC
BC
F6
D:E2
2003
c.3

BRITISH COLUMBIA

February 2003

LEGISLATIVE LIBRARY OF BRITISH COLUMBIA
3 3298 00258 8862

103-05505/

Economic Benefits of Managing Forestry and Tourism at Nimmo Bay

A Public Perception Study and Economic Analysis

B.C. Ministry of Forests
Forest Practices Branch, Economics and Trade Branch

February 2003

BRITISH COLUMBIA
Ministry of Forests

LEGISLATIVE LIBRARY
VICTORIA BC V8V 1X4 APR 10 2003

National Library of Canada Cataloguing in Publication Data

Main entry under title:

Economic benefits of managing forestry and tourism at Nimmo Bay : a public perception study and economic analysis

"Forest stewardship."—Cover.

Includes bibliographical references: p.

ISBN 0-7726-4928-6

1. Forest landscape management - Economic aspects - British Columbia - Nimmo Bay. 2. Forest management - Environmental aspects - British Columbia - Nimmo Bay. 3. Forest management - Economic aspects - British Columbia - Nimmo Bay. 4. Tourism - Economic aspects - British Columbia - Nimmo Bay. I. British Columbia. Forest Practices Branch. II. British Columbia. Economic and Trade Branch.

SB475.9.F67E26 2003 719.33'097111 C2003-960056-4

Citation:

British Columbia Ministry of Forests. 2003. Economic benefits of managing forestry and tourism at Nimmo Bay: a public perception study and economic analysis. Forest Practices Branch and Economics and Trade Branch.Victoria, B.C.

© 2003 Province of British Columbia

For further copies or information, contact:

Forest Practices Branch
8th Floor, 727 Fisgard Street
Victoria, BC
V8W 9C2

Phone (250) 387-8481

Executive Summary

For years there has been considerable rhetoric and armchair discussions on the value of forest landscapes to different industries. Maintaining scenic values for tourism in coastal landscapes is controversial because it can result in more restrictive visual prescriptions and hence a lower available timber supply. The forest industry and aspects of the tourism industry are both important forest resource–dependent sectors of our provincial economy. Optimizing the overall benefits to both industries by integrating their interests is a key challenge. This study was undertaken to address this challenge.

The Nimmo Bay project was conceived and initiated by the Forest Practices Branch and aided by the Economics and Trades Branch to examine the benefits to the Crown of managing the forest for either timber or tourism and for both activities. The Ministry of Sustainable Resource Management assisted with the delivery of the public perception survey.

Nimmo Bay Lodge was chosen for study because it had a defined viewshed with merchantable wood and planned timber-harvesting activities in the viewshed. Lodge owners were also willing to provide basic financial information and allow their clients to be surveyed.

A perception survey was administered to 96 of 500 (19.2%) lodge patrons in the summer of 2000 to determine visitor response to various visual quality scenes and silvicultural systems. The study sought to determine the proportion of clients who would/would not return to the lodge. Public acceptance ratings were generally positive for undisturbed scenes classified as preservation and for scenes classified as retention. Partial retention scenes did not elicit strong opinions and tended to receive neutral ratings. Landscapes classified as modification were generally regarded as unacceptable. Partial cut scenes, excluding retention cuts, were rated significantly higher than clearcuts. Retention cuts were rated similar to clearcuts. Among the clients who responded that they would return to a preservation scene, 77.1% said that they would return to a retention scene and 71% said that they would return to a partial retention scene. The estimated tolerance threshold for clearcutting in perspective view was 1.7% (i.e., scenes with a greater degree of alteration received, on average, a negative rating; scenes with a lesser degree of alteration received, on average, a positive rating).

Next, the viewshed for the lodge was defined. This established the landbase for benefit analysis purposes. An annual timber flow was derived for the area using Kingcome TSA data and assumptions.

The benefit analysis looked at several scenarios ranging from no harvesting to maximum harvest in four economic areas: resource value, business revenue, government revenue, and employment and income.

Study results suggest that the greatest benefit to the Crown would be realized by managing this specific viewscape to a partial retention Visual Quality Objective (VQO). Sensitivity analysis suggests that increasing the amount of area harvested in the viewscape, (e.g., to meet a "modification" VQO) would increase available timber supply but would likely result in the lodge operations becoming uneconomic due to a significant reduction in return visits.

Acknowledgements

This project would not have been possible without the help of a number of people:

Gordon Goodman of the Ministry of Sustainable Resource Management (MSRM) was instrumental in making contact with Nimmo Bay Lodge and administering the public perception survey.

Deborah and Craig Murray opened up their lodge to us for the perception study and provided the information to carry out the benefits analysis.

Geoff Kerr, British Columbia Institute of Technology co-op student, prepared much of the survey material, carried out the viewshed analysis, and compiled the preliminary wood volume summary information.

Cameron Campbell produced the visible area plot graphics.

Amanda Nemec of International Statistics carried out the statistical analysis on public perception survey data.

Sinclair Tedder of the Economics and Trade Branch performed the benefits analysis. Sinclair also took the cover and title page photographs.

Peter Fuglem and Greg Lawrance of the Timber Supply Branch provided timber flow projections.

Jacques Marc
Senior Visual Resource Management Specialist
Forest Practices Branch
February 2003

Table of Contents

Executive Summary iii

Acknowledgements iv

1.0 Introduction 1
1.1 Objectives of the Study 1

2.0 Methodology 2
2.1 Selecting a Resort for Study 2
2.2 Selecting and Classifying Photographs 3
2.3 Public Perception Survey Methodology 3
2.3.1 Statistical analysis 4

3.0 Perception Survey Results 5
3.1 Participant Profiles 5
3.2 Response to Survey Questionnaire 6
3.3 Client Reaction to Survey 6

4.0 Analysis 7
4.1 Public Acceptance Ratings (PAR) for Each Photograph 7
4.2 Relationship between PAR, Percent Alteration, Volume Removed, and Stems Removed 7
4.3 PAR Thresholds for Percent Alteration, Volume Removed, and Stems Removed 8
4.4 Silvicultural System and Visual Quality Class 8
4.5 VQC Threshold at Which the Public Would/Would Not Return to Nimmo Bay 9

5.0 Perception Survey Conclusions 10

6.0 Benefit Analysis 12
6.1 Defining the Viewshed 12
6.2 Calculating Potential Timber Flow 13
6.3 Analysis and Results 14
6.3.1 Resource value 17
6.3.2 Business revenue 19
6.3.3 Government revenues 20
6.3.4 Distributional impacts 22
6.3.5 Summary 23

7.0 Conclusion: Balancing Resource Use 25
7.1 Suggested Areas for Future Research 25
7.2 Study Limitations 25

8.0 Glossary 27

9.0 References 28

Appendices

1 Public perception survey response form and questionnaire 29
2 Landscapes evaluated by participants in Nimmo Bay public perception survey 33
3 Public acceptance ratings of landscapes 34
4 Photographs used in Nimmo study ordered by PAR 35
5 Preferences of demographic groups 48
6 Comparative analysis of Nimmo Bay employees vs. patrons 51
7 Estimates used in economic analysis 52

Tables

1. Number of slides by disturbance type and VQC 3
2. Occupation of participants in Nimmo Bay public perception survey compared with residents of British Columbia 5
3. Fitted regression models relating average PAR and landscape variables: alteration, volume removed, and stems removed 8
4. Present value of resource value for selected scenarios, by VQC for timber and lodge operation, based on a linear and non-linear assumption, a 20-year time frame, and a 5% discount rate 18
5. Present value of business revenue for selected scenarios by VQC for timber and lodge operation, based on a linear assumption, a 20-year time frame, and a 5% discount rate 20
6. Provincial government revenue for selected scenarios, by VQC for timber and lodge operation, based on a linear and non-linear assumption, a 20-year time frame, and a 5% discount rate 21
7. Employment and income impacts of modification versus partial retention VQC, based on a linear reduction assumption 23
8. Summary of forestry and lodge trade-off values for selected scenarios 24

A5.1 Silvicultural system and EVC preferences of demographic groups 49
A7.1 Resource value estimates, linear assumption 52
A7.2 Business revenue estimates, linear assumption 53
A7.3 Government revenue estimates, linear assumption 53
A7.4 Employment and income economic impacts, linear assumption 54
A7.5 Resource value estimates, linear assumption — 10 and 30 years time lines 55
A7.6 Resource value estimates, non-linear assumption 56
A7.7 Business revenue estimates, non-linear assumption 56
A7.8 Government revenue estimates, non-linear assumption 57
A7.9 Employment and income economic impact, non-linear assumption 57
A7.11 Business revenue estimates, linear assumption — limited lodge view only 58
A7.10 Resource value estimates, linear assumption — limited lodge view only 58
A7.12 Government revenue estimates, linear assumption - limited lodge view only 59
A7.13 Employment and income economic impacts, linear assumption — limited lodge view only 59

Figures

1. Process to complete the Nimmo Bay Study 2
2. Nimmo Bay location map 3
3/4. Sex and age distribution of participants in Nimmo Bay public perception survey compared with residents of British Columbia 5
5. Highest level of education attained by participants in Nimmo Bay public perception survey compared with residents of British Columbia 6
6. Size of survey respondents' hometowns 6
7. Location of survey respondents' hometowns 6
8. Primary reason for visiting Nimmo Bay Lodge 6
9. Criteria for determining whether preservation of scenery is more important than timber harvesting 6
10. Average PAR versus alteration, volume removed, and stems removed with fitted regression models 7
11. Average PAR by silvicultural system and VQC 9
12/13. Average PAR by silvicultural system and VQC: Nimmo Bay compared with 1996 and 1997 studies 9
14. Percentage of respondents who would be willing to return to Nimmo Bay Lodge if the scene depicted in practice slides P-1 to P-5 represented the surrounding view 9
15. Mackenzie Sound viewpoint visible area plot 12
16. Nimmo Bay Lodge visible area plot 13
17. Evaluation framework 15
18. Present value of resource value, by VQC and lodge business impacts, based on a linear assumption, a 20-year time frame, and a 5% discount rate 18
19. Present value of business revenue, by VQC and lodge business impacts, based on a linear assumption, a 20-year time frame, and a 5% discount rate 20
20. Provincial government revenue, by VQC and lodge business impacts, based on a linear assumption, a 20-year time frame, and a 5% discount rate 21

1.0 Introduction

1.1 Objectives of the Study

There were two fundamental goals in undertaking this study:

A. To carry out a public perception survey of a back-country tourism lodge to determine the public (lodge patron) acceptance threshold for visual disturbances in the landscape

B. To examine the trade-offs between timber harvesting and operating a wilderness tourism lodge to determine the optimal balance of competing uses

The specific objectives of part A were to determine:

1. Public Acceptance Ratings (PARs) for landscapes with increasing visual disturbances
2. Relationship between PAR, percent alteration, volume removed, and stems removed
3. Public Acceptance Thresholds for percent alteration, volume removed, and stems removed
4. Relationship between PAR, silvicultural system, and Visual Quality Class (VQC)
5. Visual Quality Class at which the public would or would not return to Nimmo Bay
6. Socio-demographic characteristics of survey respondents

The specific objectives of part B were to determine:

1. Number of hectares of visible area Timber Harvest Landbase (THLB) as viewed from the lodge
2. Timber supply flow for the viewscape
3. Economic benefits to the province of managing for different levels of Visual Quality

2.0 Methodology

This was a complex study involving a number of elements and steps, including: identifying a resort for study, selecting and classifying photographs, conducting a public perception survey, analyzing the survey results, determining public acceptance thresholds, defining the viewshed for analysis, and conducting a socio-economic benefits analysis.

To aid in doing the study, part A (the perception survey) was completed first, then part B (the economic analysis) was completed. The process is shown graphically in Figure 1.

2.1 Selecting a Resort for Study

To determine which resort would be the best candidate for this study, the following criteria were developed:

1. The resort required a defined viewshed containing merchantable timber available for harvest.
2. The resort had to have a high-quality viewscape with little or no recent visible harvesting where timber harvesting could affect the value of the resort.
3. The resort had to be willing to provide basic financial and other operating information.
4. The resort had to be willing to allow its clients to take part in a public perception study.

A list of seven possible coastal resorts was compiled initially:

- Glendale Cove Lodge, Knight Inlet
- Pacific King Lodge, Barnard Harbour
- Nimmo Bay Lodge, Mackenzie Sound
- Green Way Sound Marina, Green Way Sound
- Rivers Lodge, Goose Bay Rivers Inlet
- Sailcone Adventures, Broughton/Knight Inlet
- Eco Research, Hanson Island

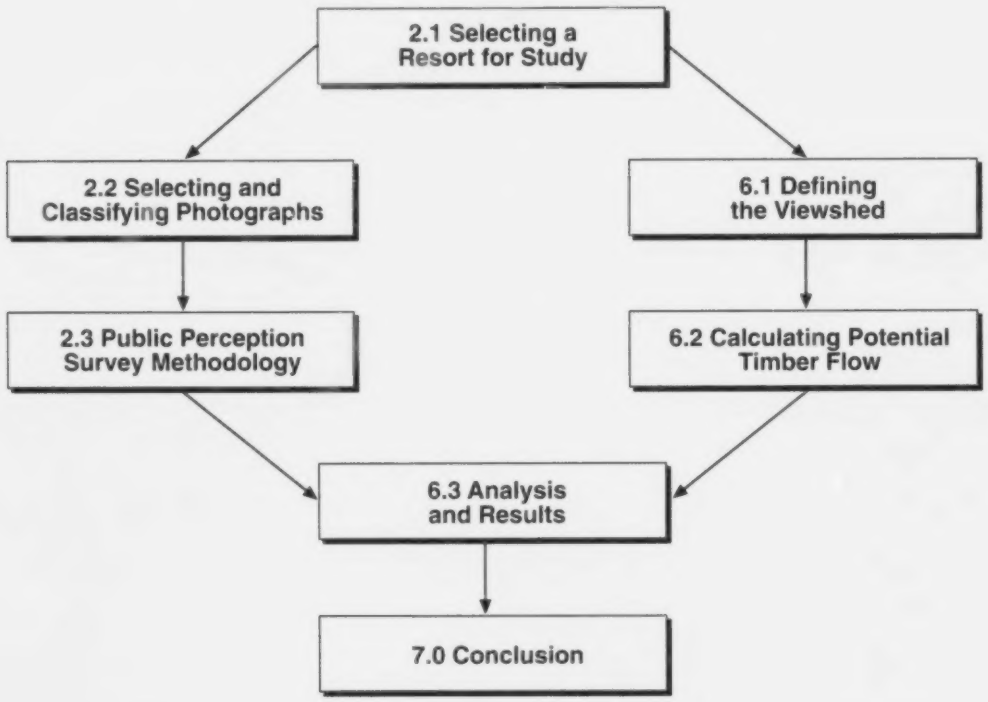

2.1 Selecting a Resort for Study
2.2 Selecting and Classifying Photographs
6.1 Defining the Viewshed
2.3 Public Perception Survey Methodology
6.2 Calculating Potential Timber Flow
6.3 Analysis and Results
7.0 Conclusion

Figure 1. *Process to complete the Nimmo Bay Study (numbers refer to section headings).*

Nimmo Bay was found to have the most merchantable wood available in its viewshed. When approached about participating in the study, owner-operators Deborah and Craig Murray were agreeable.

Nimmo Bay Lodge is located on British Columbia's mainland coast, off the northern end of Vancouver Island, and is accessible by boat, helicopter, or float plane from the North Island communities of Port Hardy and Port McNeill. (See Figure 2.)

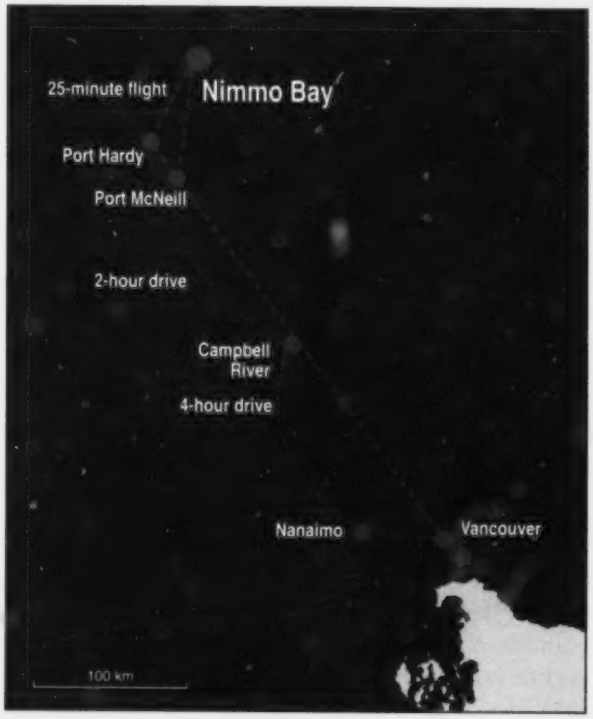


Figure 2. Nimmo Bay location map.

2.2 Selecting and Classifying Photographs

In order to carry out the public perception survey, a series of colour slides was selected showing natural and human-altered scenes. The altered scenes were further separated by Visual Quality Class and silvicultural system. The scenes depicted in the slides were classified into Visual Quality Classes by a team of Ministry of Forests visual resource management specialists. The slides by disturbance type and Visual Quality Class are described in Table 1.

2.3 Public Perception Survey Methodology

Once the photographs had been selected and calibrated, a public perception survey was undertaken at the Nimmo Bay Lodge to gauge the preferences of lodge patrons to a variety of landscape scenes and visual conditions.

The objective was to sample as many people as possible. Groups were selected by the lodge owners based on their willingness to participate. Each group was asked if they would like to participate. If a group said yes, a survey was conducted. If a group said no, the survey was not conducted. Seventy-five lodge patrons (about 15% of all guests) and 21 employees agreed to participate in the public preference survey (total sample size, n = 96).

To conduct the survey, slides were projected on a large screen, 2 × 2 m, in a darkened room. Five practice slides (one from P, R, and PR, and two from M) were shown initially in random order. This was to

Table 1. Number of slides by disturbance type and VQC

	Visual Quality Class (VQC)				
Disturbance type	Preservation (P)	Retention (R)	Partial Retention (PR)	Modification (M)	Total number of slides
Natural Disturbance (ND)	5	0	1	0	6
Partial Cut (PC)	0	5	5	5	15
Clearcut(CC)	0	4	8	6	18
Retention (R)	0	0	3	3	6
Hand Logging (HL)	0	1	1	0	2
Road	0	0	0	2	2
Total number of slides	5	10	18	16	49

Note: The disturbance types listed in Table 1 are defined in the Glossary.

Nimmo Bay was found to have the most merchantable wood available in its viewshed. When approached about participating in the study, owner-operators Deborah and Craig Murray were agreeable.

Nimmo Bay Lodge is located on British Columbia's mainland coast, off the northern end of Vancouver Island, and is accessible by boat, helicopter, or float plane from the North Island communities of Port Hardy and Port McNeill. (See Figure 2.)

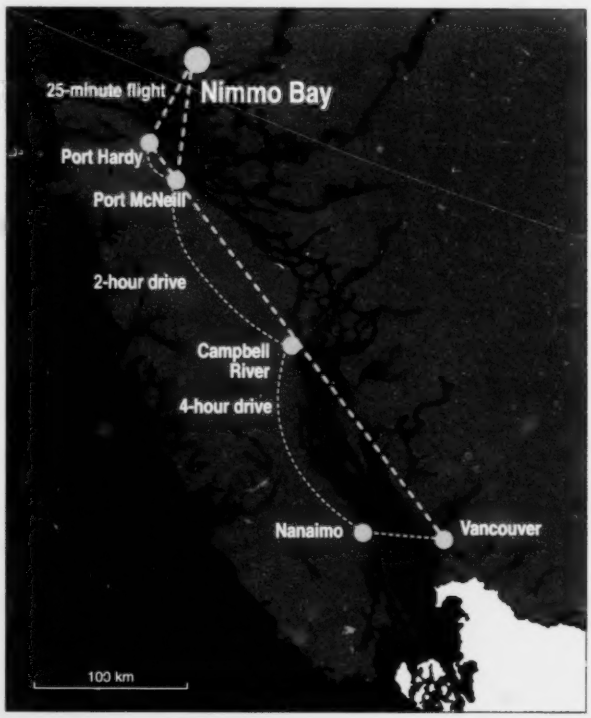


Figure 2. Nimmo Bay location map.

2.2 Selecting and Classifying Photographs

In order to carry out the public perception survey, a series of colour slides was selected showing natural and human-altered scenes. The altered scenes were further separated by Visual Quality Class and silvicultural system. The scenes depicted in the slides were classified into Visual Quality Classes by a team of Ministry of Forests visual resource management specialists. The slides by disturbance type and Visual Quality Class are described in Table 1.

2.3 Public Perception Survey Methodology

Once the photographs had been selected and calibrated, a public perception survey was undertaken at the Nimmo Bay Lodge to gauge the preferences of lodge patrons to a variety of landscape scenes and visual conditions.

The objective was to sample as many people as possible. Groups were selected by the lodge owners based on their willingness to participate. Each group was asked if they would like to participate. If a group said yes, a survey was conducted. If a group said no, the survey was not conducted. Seventy-five lodge patrons (about 15% of all guests) and 21 employees agreed to participate in the public preference survey (total sample size, n = 96).

To conduct the survey, slides were projected on a large screen, 2 × 2 m, in a darkened room. Five practice slides (one from P, R, and PR, and two from M) were shown initially in random order. This was to

Table 1. Number of slides by disturbance type and VQC

	Visual Quality Class (VQC)				
Disturbance type	Preservation (P)	Retention (R)	Partial Retention (PR)	Modification (M)	Total number of slides
Natural Disturbance (ND)	5	0	1	0	6
Partial Cut (PC)	0	5	5	5	15
Clearcut(CC)	0	4	8	6	18
Retention (R)	0	0	3	3	6
Hand Logging (HL)	0	1	1	0	2
Road	0	0	0	2	2
Total number of slides	5	10	18	16	49

Note: The disturbance types listed in Table 1 are defined in the Glossary.

orient respondents to the survey process, allow for questions, and allow them to calibrate their rating systems.

Forty-nine slides including the practice slides were used for the main survey. The images displayed a variety of Visual Quality Classes, a variety of silvicultural systems, and some natural scenes. The 49 slides were shown under standardized conditions in all surveys. A standardized introduction to the survey was given in a professional and unbiased manner by a Ministry of Tourism representative.

The slides were arranged in the same random order for each of the surveys. Each of the slides was shown for 15 seconds, and a prompt was given before moving to the next slide. (To determine whether lodge patrons rated the slides independently, the order of the slides was reversed for group 2.)

The respondents were asked to rate how acceptable they found the visual quality in each slide on a seven-point likert scale where +3 = very acceptable, +1 = slightly acceptable, 0 = neutral, -1 = slightly unacceptable, and -3 = very unacceptable. A space was included on the evaluation form for comments as to why respondents rated the photo the way they did.

Each participant was asked to complete a follow-up questionnaire to obtain socio-economic variables such as age, sex, education level, occupation, and country of origin. Appendix 1 contains a copy of the response form and follow-up questionnaire.

Each survey was approximately 25–30 minutes in length.

2.3.1 Statistical analysis

Simple descriptive statistics were compiled for the 49 slides and for the 96 survey participants who rated them. Landscape alteration, volume removed, and stems removed were summarized by tabulating the mean, standard deviation, and number of slides in each silviculture system and Visual Quality Class. Demographic profiles (number and percentage of respondents by sex, age, level of education, etc.) were constructed for the survey respondents, and chi-squared tests (using census data to compute expected frequencies) were used to compare the results with provincial profiles.

Frequency distributions (number and percentage) of the public acceptance ratings (PARs) were tabulated and plotted separately for each slide. To analyze the relationship between public acceptance of a forest scene and key landscape variables, average PAR (i.e., PAR averaged over respondents) was plotted against degree of alteration (log transformation), volume removed, and stems removed. A simple (univariate) regression model was fitted for each variable, tested for statistical significance, and used to estimate (by inverting the fitted equation) a threshold for public acceptance. Two-way (fixed-effects) analysis of variance (ANOVA) was used to compare average PAR scores by silvicultural system and VQC.

Relative ratings or preferences for one silvicultural system, or VQC, over another were calculated by comparing each respondent's scores for all pairs of slides from the two classes being compared (e.g., a respondent's preference for partial cuts over clearcuts was based on a comparison of scores for all pairs of slides where one slide depicted a partial cut and the other a clearcut). The results were expressed as the percentage of pairs for which the first slide scored higher than the second, with ties counted as 0.5 for each class. 'No preference' corresponds to a value of 50% (i.e., half the time the first class scored higher than the second and half the time the second slide received the higher rating). Personal preferences were calculated for all pairs of silvicultural systems and VQCs, and averaged over respondents, to give an estimate of overall public preference, as well as the preferences of demographic groups. Differences between demographic groups were evaluated with a series of ANOVA F-tests (and Kruskal-Wallis tests, which are non-parametric and therefore less restrictive than the F-tests).

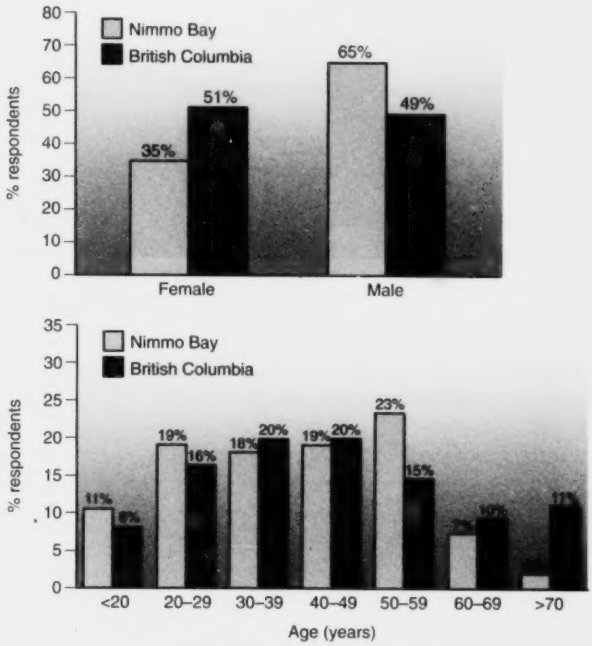
3.0 Perception Survey Results

3.1 Participant Profiles

This section presents the demographic statistics collected from the respondents, and in some cases compares these with the socio-demographic characteristics for the provincial population taken from BC Stats, 2000.

Figures 3–7 and Table 2 summarize the demographic distribution of the 96 survey participants. Population statistics for British Columbia residents, 15 years and older, are provided for comparison, where applicable.

The results show that the surveyed population differed significantly from the province as a whole. The survey participants were disproportionately male and younger than the residents of British Columbia (Figures 3 and 4), and they tended to be better educated (Figure 5) and more likely to have occupations related to "social science, education, government" or "art, culture, recreation, sports" (Table 2). Over half the group was from the United States (Figure 7) and 39% were from a "large city" (Figure 6).



Figures 3 and 4. *Sex and age distribution of participants in Nimmo Bay public perception survey compared with residents of British Columbia (15 years and older).*

Table 2. *Occupation of participants in Nimmo Bay public perception survey compared with residents of British Columbia (15 years and older)*

Occupation	Nimmo Bay N	Nimmo Bay %	B.C. (1996) %
Management	10	15.6	9.6
Business, finance, administration	8	12.5	18.5
Natural and applied sciences	5	7.8	4.8
Health	4	6.3	4.7
Social science, education, government	13	20.3	6.6
Art, culture, recreation, sports	10	15.6	2.9
Sales and service	8	12.5	27.8
Trades, transport, equipment operators	4	6.3	15.1
Primary industry	1	1.6	4.7
Processing, manufacturing, utilities	1	1.6	5.4
All occupations	64	100.0	100.0
Not applicable (retired, homemaker, student, etc.)	32	33.3	
Total	96	100.0	

Note: While the people surveyed as part of this study were frequently found to have occupations related to "social science, education, and government", they were, in many cases, sponsored by large corporations and therefore, the actual clients (i.e., those responsible for paying the bill at Nimmo Bay) might have been more accurately classified as "management" (i.e., CEOs or chairmen of the board).

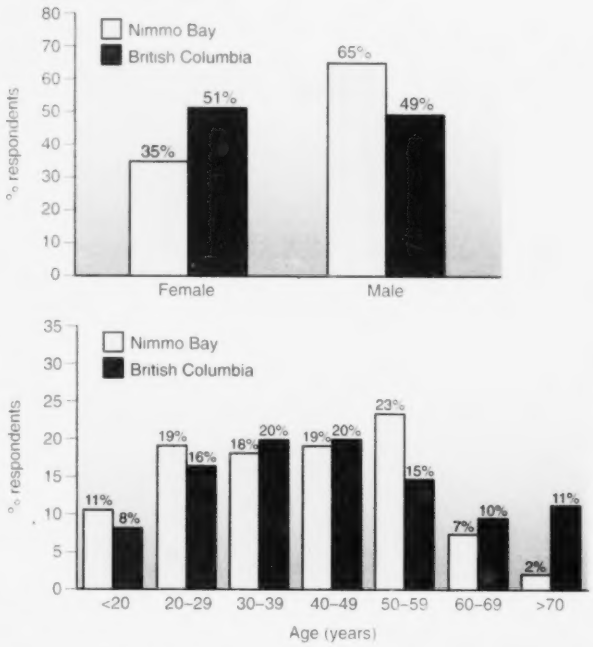
3.0 Perception Survey Results

3.1 Participant Profiles

This section presents the demographic statistics collected from the respondents, and in some cases compares these with the socio-demographic characteristics for the provincial population taken from BC Stats, 2000.

Figures 3–7 and Table 2 summarize the demographic distribution of the 96 survey participants. Population statistics for British Columbia residents, 15 years and older, are provided for comparison, where applicable.

The results show that the surveyed population differed significantly from the province as a whole. The survey participants were disproportionately male and younger than the residents of British Columbia (Figures 3 and 4), and they tended to be better educated (Figure 5) and more likely to have occupations related to "social science, education, government" or "art, culture, recreation, sports" (Table 2). Over half the group was from the United States (Figure 7) and 39% were from a "large city" (Figure 6).



Figures 3 and 4. *Sex and age distribution of participants in Nimmo Bay public perception survey compared with residents of British Columbia (15 years and older).*

Table 2. *Occupation of participants in Nimmo Bay public perception survey compared with residents of British Columbia (15 years and older)*

	Nimmo Bay		B.C. (1996)
Occupation	**N**	**%**	**%**
Management	10	15.6	9.6
Business, finance, administration	8	12.5	18.5
Natural and applied sciences	5	7.8	4.8
Health	4	6.3	4.7
Social science, education, government	13	20.3	6.6
Art, culture, recreation, sports	10	15.6	2.9
Sales and service	8	12.5	27.8
Trades, transport, equipment operators	4	6.3	15.1
Primary industry	1	1.6	4.7
Processing, manufacturing, utilities	1	1.6	5.4
All occupations	64	100.0	100.0
Not applicable (retired, homemaker, student, etc.)	32	33.3	
Total	96	100.0	

Note: While the people surveyed as part of this study were frequently found to have occupations related to "social science, education, and government", they were, in many cases, sponsored by large corporations and therefore, the actual clients (i.e., those responsible for paying the bill at Nimmo Bay) might have been more accurately classified as "management" (i.e., CEOs or chairmen of the board).

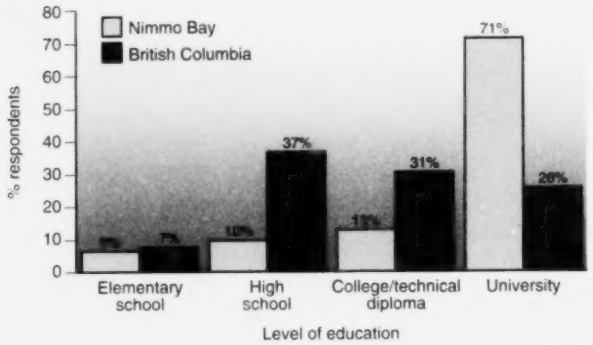


Figure 5. *Highest level of education attained by participants in Nimmo Bay public perception survey compared with residents of British Columbia (15 years and older).*

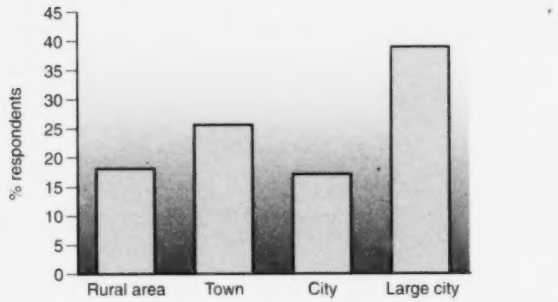


Figure 6. *Size of survey respondents' hometowns.*

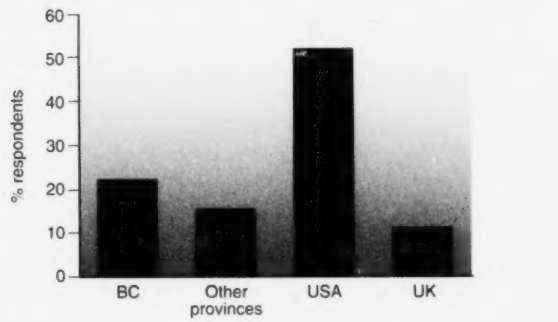


Figure 7. *Location of survey respondents' hometowns.*

3.2 Response to Survey Questionnaire

After providing demographic information, respondents were asked questions related to scenic quality. (Note: More than one response was allowed for each question.)

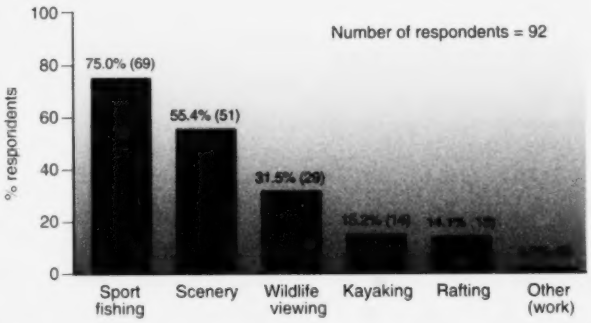


Figure 8. *Primary reason for visiting Nimmo Bay Lodge (number of responses in brackets).*

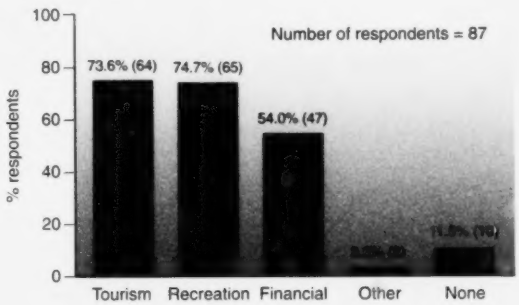


Figure 9. *Criteria for determining whether preservation of scenery is more important than timber harvesting (number of responses in brackets).*

3.3 Client Reaction to Survey

Some of the lodge clients who participated in the survey reported it as providing a negative experience. They felt that they were at the lodge to relax and enjoy the natural setting, and did not enjoy looking at photos of less-than-desirable landscapes.

4.0 Analysis

This section reports on the analysis of the results, organized according to the study objectives (see Section 1.0 Introduction).

4.1 Public Acceptance Ratings (PARs) for Each Photograph

Public acceptance ratings (PARs) for each of the 49 slides are tabulated by percentage and frequency of scores in Appendix 3. A scene of Kennedy Lake, near Highway 4 (Slide 25, VQC = preservation), received the highest overall rating (average PAR = 2.19), while a view of a clearcut with site disturbance (Slide 24, VQC = modification) was rated the most unacceptable (average PAR = -2.52). The distribution of scores for these two scenes and the other 47 slides are plotted in order of decreasing average PAR in Appendix 4 (histograms and photos).

Twenty-one of the 49 slides were evaluated in one or both of two previous public perception surveys conducted in various communities throughout the province (B.C. Ministry of Forests 1996, 1997). One of the objectives of the study was to compare lodge patron responses to those of the general public for the same slides. Average PAR scores based on these two studies are given in Appendix 2, where the seven-point (1–7) rating system for the 1996 study and the 11-point (-5 to +5) system for the 1997 study have been translated (by linear transformation) to the seven-point Nimmo Bay scale. PAR ratings for both studies correlate well with the Nimmo Bay scores: Pearson correlations for the two data sets are R = 0.97 and R = 0.83, respectively, where R = 1 implies perfect agreement.

4.2 Relationship between PAR, Percent Alteration, Volume Removed, and Stems Removed

The dependence of public acceptance on the degree of alteration of a landscape and on the proportion of volume and stems removed from a site is illustrated in Figure 10, with the corresponding results from the 1996 and 1997 surveys included for comparison.

An increase in (log) alteration was associated with a significant decrease in acceptance of a forest scene by the Nimmo Bay survey group (p = 0.0006). A similar effect was evident in the 1996 and 1997 data but the relationships were less well defined (upper panel, Figure 10), owing to the small number of slides in common with the Nimmo Bay survey. Both the Nimmo Bay and 1997 average PAR scores (no data for 1996) showed a downward trend as the fraction of volume and stems removed increased (middle and lower panels, Figure 10); however, none of the trends was statistically significant (Table 3).

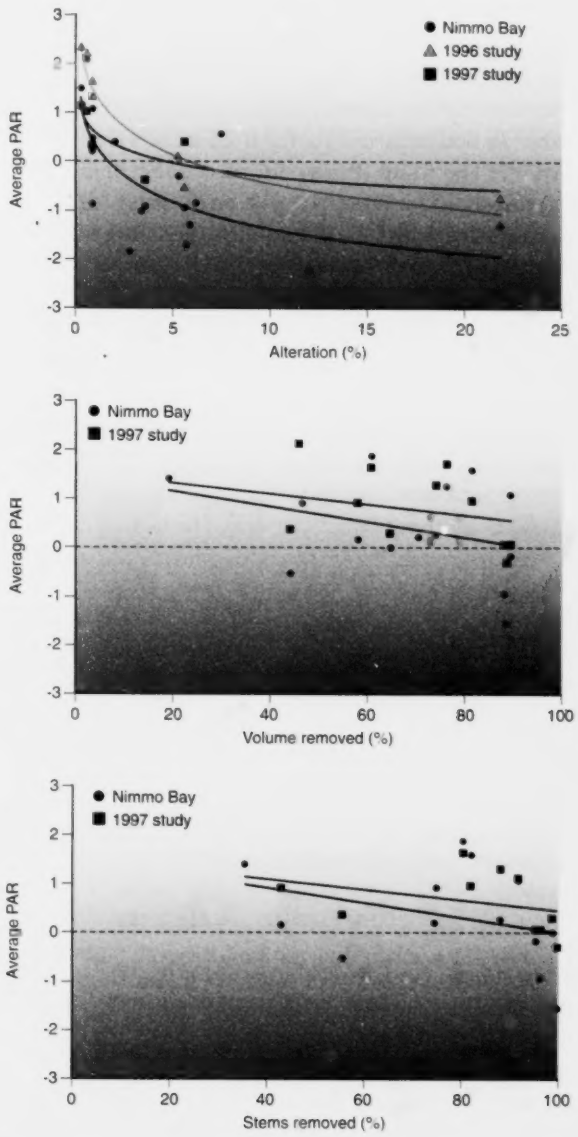


Figure 10. Average PAR versus alteration (%), volume removed (%), and stems removed (%) with fitted regression models (see Table 3).

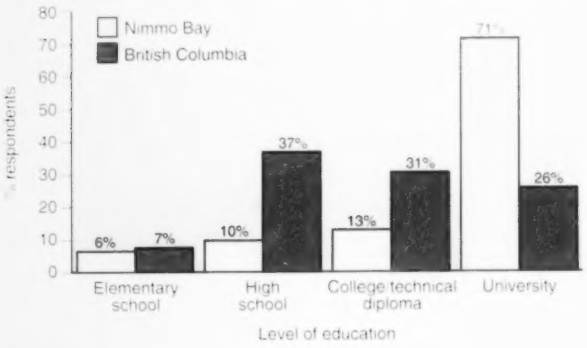


Figure 5. Highest level of education attained by participants in Nimmo Bay public perception survey compared with residents of British Columbia (15 years and older).

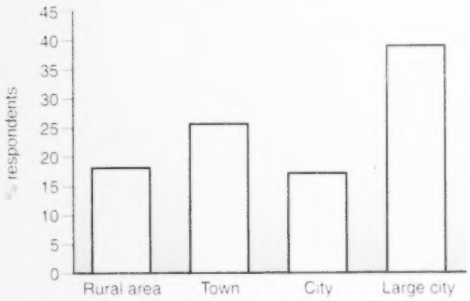


Figure 6. Size of survey respondents' hometowns.

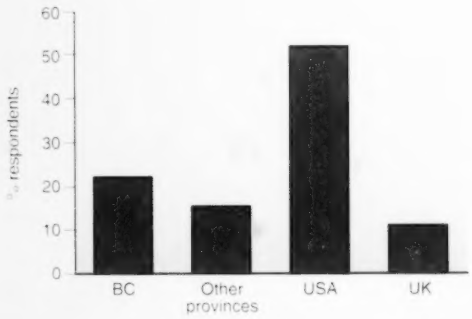


Figure 7. Location of survey respondents' hometowns.

3.2 Response to Survey Questionnaire

After providing demographic information, respondents were asked questions related to scenic quality. (Note: More than one response was allowed for each question.)

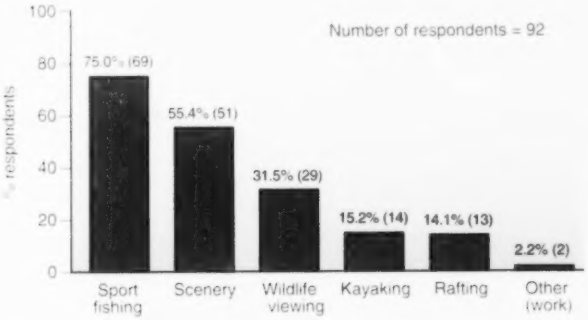


Figure 8. Primary reason for visiting Nimmo Bay Lodge (number of responses in brackets).

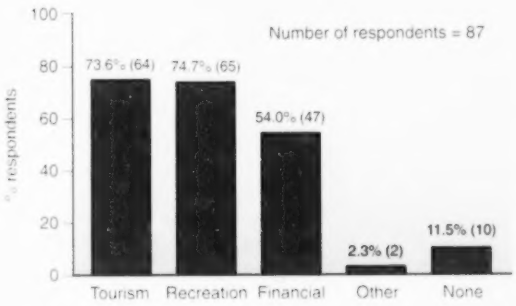


Figure 9. Criteria for determining whether preservation of scenery is more important than timber harvesting (number of responses in brackets).

3.3 Client Reaction to Survey

Some of the lodge clients who participated in the survey reported it as providing a negative experience. They felt that they were at the lodge to relax and enjoy the natural setting, and did not enjoy looking at photos of less-than-desirable landscapes.

4.0 Analysis

This section reports on the analysis of the results, organized according to the study objectives (see Section 1.0 Introduction).

4.1 Public Acceptance Ratings (PARs) for Each Photograph

Public acceptance ratings (PARs) for each of the 49 slides are tabulated by percentage and frequency of scores in Appendix 3. A scene of Kennedy Lake, near Highway 4 (Slide 25, VQC = preservation), received the highest overall rating (average PAR = 2.19), while a view of a clearcut with site disturbance (Slide 24, VQC = modification) was rated the most unacceptable (average PAR = -2.52). The distribution of scores for these two scenes and the other 47 slides are plotted in order of decreasing average PAR in Appendix 4 (histograms and photos).

Twenty-one of the 49 slides were evaluated in one or both of two previous public perception surveys conducted in various communities throughout the province (B.C. Ministry of Forests 1996, 1997). One of the objectives of the study was to compare lodge patron responses to those of the general public for the same slides. Average PAR scores based on these two studies are given in Appendix 2, where the seven-point (1–7) rating system for the 1996 study and the 11-point (-5 to +5) system for the 1997 study have been translated (by linear transformation) to the seven-point Nimmo Bay scale. PAR ratings for both studies correlate well with the Nimmo Bay scores: Pearson correlations for the two data sets are R = 0.97 and R = 0.83, respectively, where R = 1 implies perfect agreement.

4.2 Relationship between PAR, Percent Alteration, Volume Removed, and Stems Removed

The dependence of public acceptance on the degree of alteration of a landscape and on the proportion of volume and stems removed from a site is illustrated in Figure 10, with the corresponding results from the 1996 and 1997 surveys included for comparison.

An increase in (log) alteration was associated with a significant decrease in acceptance of a forest scene by the Nimmo Bay survey group (p = 0.0006). A similar effect was evident in the 1996 and 1997 data but the relationships were less well defined (upper panel, Figure 10), owing to the small number of slides in common with the Nimmo Bay survey. Both the Nimmo Bay and 1997 average PAR scores (no data for 1996) showed a downward trend as the fraction of volume and stems removed increased (middle and lower panels, Figure 10); however, none of the trends was statistically significant (Table 3).

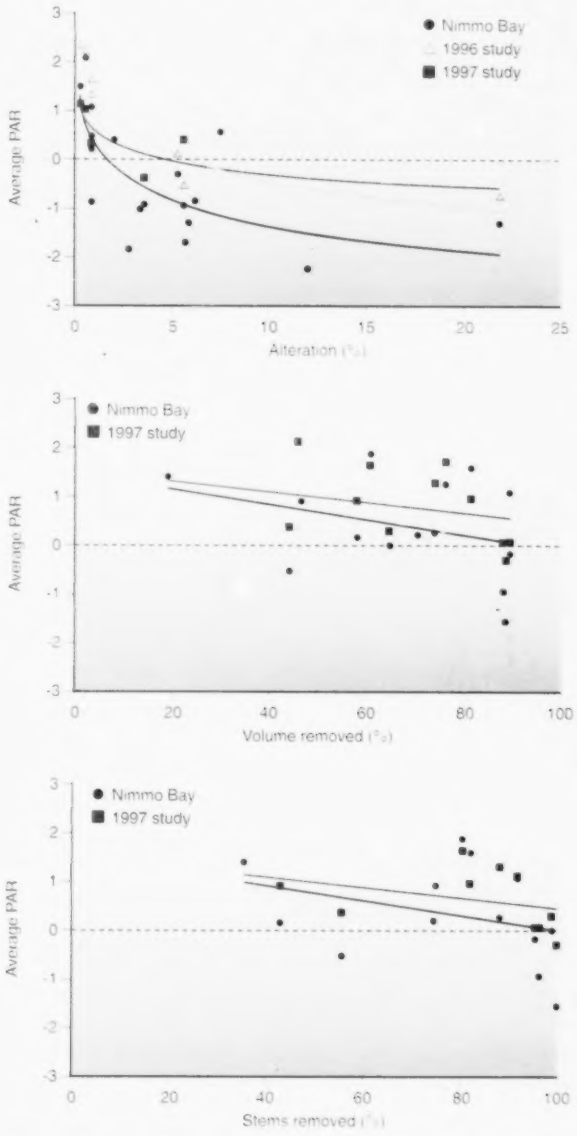


Figure 10. Average PAR versus alteration (%), volume removed (%), and stems removed (%) with fitted regression models (see Table 3).

4.3 PAR Thresholds for Percent Alteration, Volume Removed, and Stems Removed

Table 3 summarizes the fitted regression models and derived "thresholds" for public acceptance. The findings of the Nimmo Bay survey suggest that public acceptance of the visible impacts of logging declines markedly as the degree of alteration of the landscape increases (Figure 10). The estimated threshold between those scenes generally considered acceptable (PAR > 0) and those deemed unacceptable (PAR < 0) was obtained by inverting the fitted regression equation relating average PAR to percent alteration (Table 3), and substituting the borderline value PAR = 0. The result (third column of Table 3) implies that threshold for acceptance is, on average, 1.7% alteration, or with 95% confidence, the value lies between 0.9% and 3.1% alteration.

The less reliable 1996 and 1997 equations place the threshold somewhat higher, at 5.9% and 4.7%, respectively. Owing to an apparent lack of correlation with PAR, derived thresholds for volume removed and stems removed, both of which exceed 90%, have little practical meaning other than to suggest that considerable amount of volume/stems can be removed and still meet with public satisfaction. The lack of correlation is due primarily to the small number of partial cutting samples (N=15).

4.4 Silvicultural System and Visual Quality Class (VQC)

Figure 11 shows the relationship between average PAR (Nimmo Bay), silvicultural system, and VQC. Both silvicultural system and VQC appear to have had a significant (and independent) influence on the Nimmo Bay PAR scores. Figure 11 suggests that differences between silvicultural systems did not depend on VQC, and vice versa ($p = 0.3497$ based on ANOVA of combinations represented by the data). Average PAR scores for the clearcuts (all VQCs) were significantly lower than those for the partial cuts ($p = 0.0241$), but they did not differ significantly from the mean scores for variable retention (in the case of VQC = PR or M; $p = 0.2635$). Similarly, partial cuts received noticeably lower ratings than natural (preservation) scenes ($p = 0.0323$). Comparison of the VQCs demonstrated that the mean scores (all silvicultural systems) were comparable for slides in the preservation and retention categories ($p = 0.8373$), while retention slides tended to score higher than the partial retention group ($p = 0.0026$), and partial retention scenes likewise received better scores than those classified as modification ($p < 0.0001$). These trends were generally consistent with trends in the 1996 and 1997 data (Figures 12 and 13), although incomplete samples and different PAR scales preclude direct comparison.

Table 3. *Fitted regression models relating average PAR and landscape variables: alteration, volume removed, and stems removed*

x	Fitted equation: y = a + b x a (std. err.)	b (std. err.)	Threshold for acceptance -a/b ($e^{-a/b}$)	N	R^2	Prob[a]	Source
Log (percent alteration)	0.395 (0.271)	-0.761 (0.179)	1.7 (0.9–3.1)[b]	18	0.53	0.0006	Nimmo Bay
	1.429 (0.147)	-0.807 (0.095)	5.9	7	0.94	0.0004	1996 study
	0.594 (0.209)	-0.382 (0.185)	4.7	5	0.59	0.1316	1997 study
Percent volume removed	1.460 (0.929)	-0.016 (0.013)	93.3 (33.5–100)	14	0.11	0.2584	Nimmo Bay
	1.524 (1.071)	-0.011 (0.014)	100	11	0.06	0.4692	1997 study
Percent stems removed	1.524 (1.094)	-0.015 (0.014)	100 (41.2–100)	13	0.10	0.2853	Nimmo Bay
	1.506 (0.928)	-0.011 (0.011)	100	10	0.10	0.3643	1997 study

a "Prob" is the statistical significance of the fitted regression model.

b The 95% confidence limits for Nimmo Bay threshold are given in brackets.

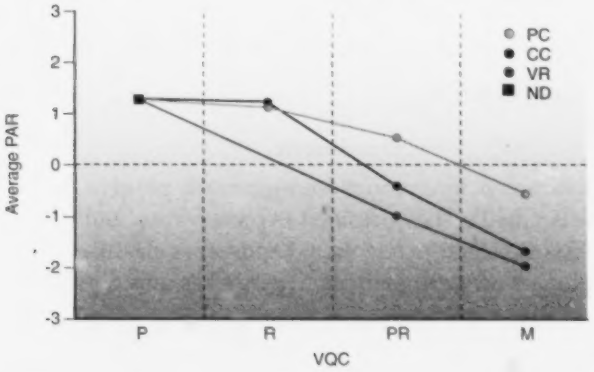
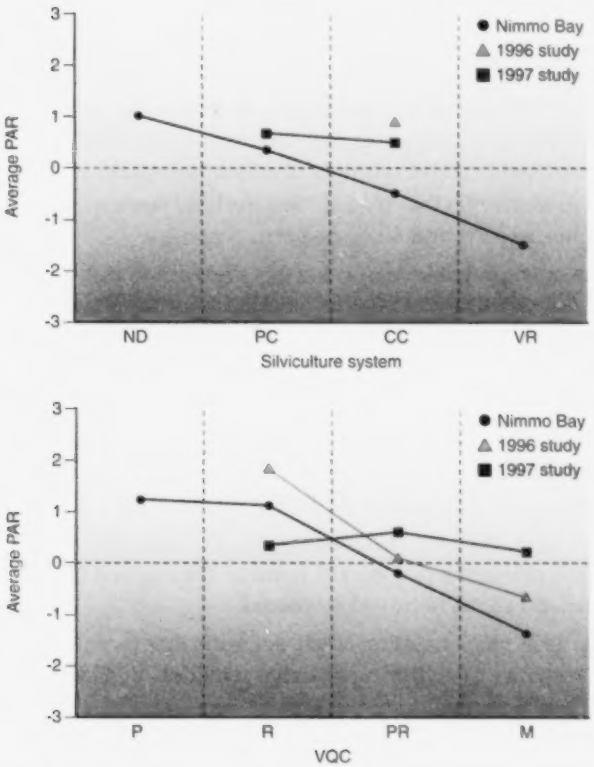


Figure 11. *Average PAR by silvicultural system and VQC (Nimmo Bay results averaged over respondents and slides).*



Figures 12 and 13. *Average PAR by silvicultural system and VQC: Nimmo Bay compared with 1996 and 1997 studies.*

4.5 VQC threshold at Which the Public Would/Would Not Return to Nimmo Bay

When respondents were asked whether they would be willing to return to Nimmo Bay Lodge if the scenes shown represented the surrounding view, 81% (48 of 59) of the people who were asked[1] answered yes for the preservation scene (slide P-4). This response suggests that 19% would not return for reasons unrelated to logging. To help ensure that all responses to question 3 reflect perceptions of visual quality and not other factors, results are presented for those 48 people who said that they would return for the preservation scene. Restricting attention to this subsample (of which 100% would return for the preservation scene) we learned that 77.1% would return to a retention scene (Slide P-2), 70.8% would return to a partial retention scene (slide P-5), and 35.4% would return to a modification scene (Slide P-1). These results are presented in Figure 14.

The goal of this test was to get a snapshot view of the percentage of patrons who would / would not return to Nimmo Bay, to guide economic analysis.

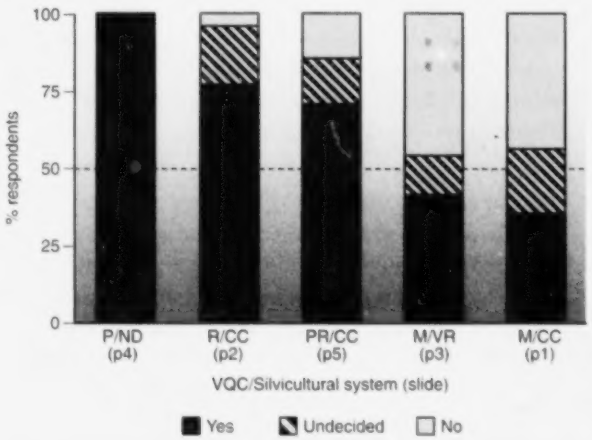


Figure 14. *Percentage of respondents (N = 48) who would be willing to return to Nimmo Bay Lodge if the scene depicted in practice slides P-1 to P-5 represented the surrounding view. (Results are for respondents who answered "Yes" to Slide P-4 a preservation scene.)*

[1] There were only 59 responses to this question because the first 37 survey participants (21 resort employees and 16 visitors) were not asked this question.

5.0 Perception Survey Conclusions

This section presents conclusions based on statistical analyses of the results.

Objective	Conclusion
(i) Determine Public Acceptance Ratings (PARs) for each photograph	Public acceptance ratings were generally positive for undisturbed scenes classified as preservation and for scenes classified as retention. Landscapes classified as modification were generally regarded as unacceptable. Partial retention scenes did not elicit strong opinions and tended to receive ratings near zero. These results are consistent with findings in both the 1996 and 1997 studies.
(ii) Determine the relationship between PAR, percent alteration, volume removed, and stems removed	As the percent alteration increased on the landscape, there was a significant decrease in PAR. As the fraction of volume and stems removed increased, the PAR scores showed a downward trend
(iii) Determine public acceptance thresholds for percent alteration, volume removed, and stems removed	The participants in the Nimmo Bay survey accepted up to 1.7% alteration for clearcutting operations in perspective view. This is significantly lower than previously completed British Columbia resident perception studies (1996 and 1997) that placed the threshold somewhat higher, at 5.9% and 4.7%, respectively. The most probable reason for this decrease in public acceptance threshold is the very nature of the activities that the participants are involved in, namely recreating in wilderness and scenic coastal settings. It was not possible in this study to determine the thresholds for volume removed and stems removed, owing to small sample size (N=15) and the lack of a statistically significant correlation with PAR. However, both the Nimmo Bay and 1997 average PAR scores showed a downward trend as the fraction of volume and stems removed increased. The 1997 partial cutting study suggests that there is a 90% chance of achieving a partial retention VQC with a 40–60% removal rate.
(iv) Determine the relationship between PAR, silvicultural system, and VQC	Nimmo Bay respondents generally preferred natural scenes to partial cuts and partial cuts over clearcuts. Intuitively, one might have expected variable retention cuts preferred to clearcuts; however, in the case of the Nimmo Bay survey, the results are inconclusive (due to the small number [N=6] of retention cut slides). The average PAR score for the clearcuts was greater than the mean score for retention cuts but the difference was not statistically significant.

Section 4.5 examined guest return rates relative to different Visual Quality Classes and silvicultural systems. In response to this question, 41.7% of the guests (who responded favourably to the preservation scene, P-4) said that they would return to a modification VQC retention cut scene (slide P-3), compared with 35.4% for the modification VQC clearcut scene (slide P-1). This comparison is based on a single pair of slides (one CC and one VR). If all CC/VR pairings are considered, then CC is generally preferred over VR.

(v) Determine the level of Visual Quality Class at which the public would/would not return to Nimmo Bay

A total of 81% (48 of 59) people said that they would return to Nimmo Bay if the landscape met a preservation visual quality. This response suggests that 19% would not return for reasons unrelated to logging.

Of the 48 people who responded favourably to the preservation scene (Slide P-4), 77.1% would return to a retention scene (Slide P-2), 70.8% would return to a partial retention scene (slide P-5), and 35.4% would return to a modification scene (Slide P-1).

The results suggest that lodge patrons would return to the lodge if the landscape were managed to a partial retention visual quality, but that there could potentially be some loss of repeat business. Interestingly, the lodge enjoys a 72% repeat business.

(vi) Determine socio-demographic characteristics of survey respondents

The results show that the survey population differed significantly from the province as a whole. The survey participants were disproportionately male and younger than the residents of British Columbia and they tended to be better educated. Over half the group were from the United States.

The largest single group of people surveyed as part of this study was found to have occupations related to "social science, education, and government" (20.3%). Business and management clients combined made up 28.1%. The lodge operator noted that many of the clients paying the bills at Nimmo Bay are CEOs or Chairmen of the Boards of major corporations.

6.0 Benefit Analysis

The purpose of this section is to provide an evaluation of potential economic trade-offs between forestry activity and a tourism lodge operation, under a range of visual quality objectives for timber removal. To facilitate this type of analysis, both the forestry and the tourism sector need to be assessed in a similar manner. This means that the value associated with a flow of timber is compared to a value associated with the flow of benefits accruing to the lodge operation. For the Nimmo Bay viewscape, the stock of timber was identified in a mapping exercise described in section 6.1. This was then converted into an annual flow of timber available for harvest over time as described in section 6.2.

It was important to convert the standing volume into a flow because timber gets its commercial value from being transformed into products for sale, and not as it stands in the forest.[2] Viewing timber in this manner provides values that are comparable to those estimated for the operation of the lodge. The area surrounding the lodge provides timber to the timber industry and value to the lodge in the form of its scenic beauty. Therefore, the area, the trees in the forest, and the view provide a resource to the lodge, which it turns into a flow of income. This "viewscape" value comes from the lodge's ability to attract and charge people for a service (transportation to the lodge, food and lodging) and use (viewing enjoyment, among other activities) of the surrounding resource. So, like the timber industry, the lodge is turning the resource stock into a flow of value over time.

6.1 Defining the Viewshed

In order to carry out the benefit analysis for timber harvesting and tourism lodge operation at Nimmo Bay, the first step was to define the immediate viewshed as seen from the Nimmo Bay Lodge and from a general-purpose viewpoint in MacKenzie Sound.

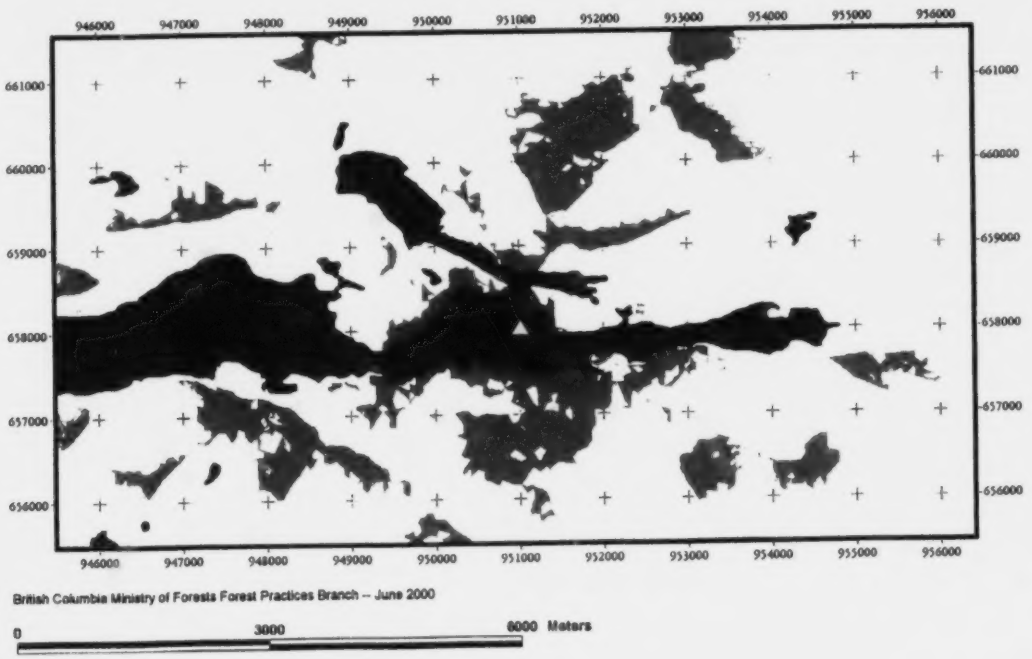


Figure 15. Mackenzie Sound viewpoint visible area plot.

[2] Standing timber has many values, such as its contribution to the biological functioning of the ecosystem and the value we attach to its existence. In the context of this analysis, the commercial value of lumber and other forest products is of interest. Other commercial values may eventually include standing timber's contribution to carbon and biodiversity credit systems. For a general description of a variety of values in the forest see Gregory, G.R. 1987. Resource economics for foresters. John Wiley & Sons Inc., New York, N.Y.

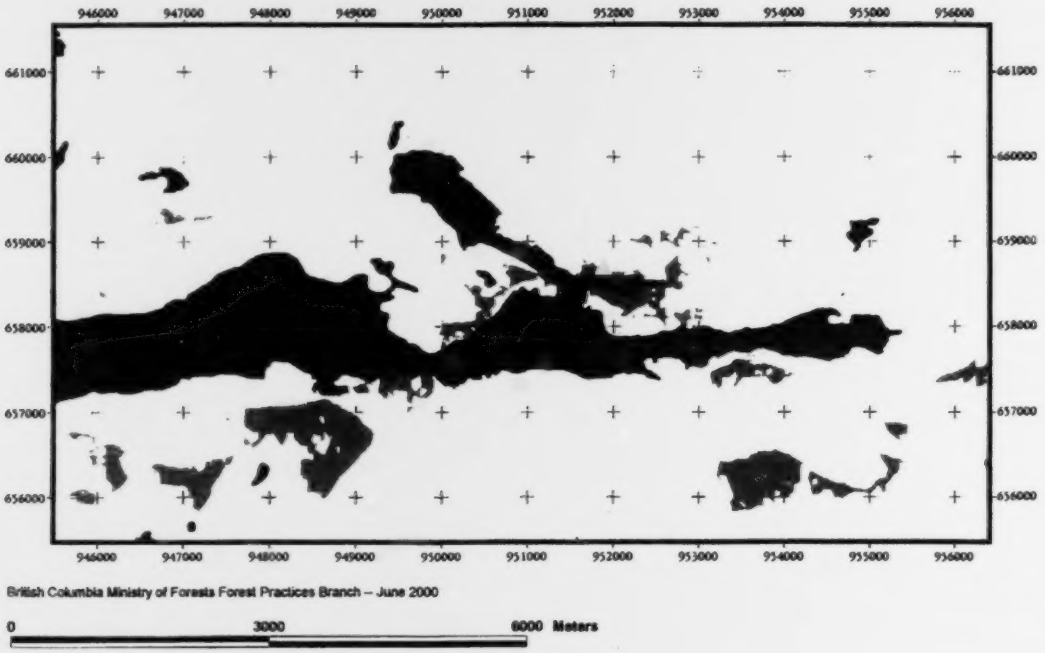


Figure 16. *Nimmo Bay Lodge visible area plot.*

To define the area visible from Nimmo Bay Lodge and the MacKenzie Sound viewpoint, visible area plots were produced using Microstation Version 5.07 with Maps 3D Version 2.52. software and Ministry of Environment TRIM mapping data. A computer derives the visible area by generating a multitude of topographic profiles in a 360-degree radius from the viewpoint.

The purpose of the visibility analysis was to generate a map of the forested area visible from the lodge and from the Mackenzie Sound viewpoint (see Figures 15 and 16). Once the visible area was determined, it was used to calculate the area and timber volume in each viewshed.

The combined area of the two viewsheds (excluding all overlapped area) was found to include approximately 1033 hectares of THLB.

6.2 Calculating Potential Timber Flow

In order to carry out the benefits analysis, the approximate timber flow from the Nimmo Bay viewshed needed to be calculated.

The Kingcome Timber Supply Analysis report prepared in 2001 assumes clearcutting to be current management. On the assumption that it takes on average 18 years to achieve visually effective green-up, annual harvest potential was calculated for five possible management scenarios:

- No management constraints
- Modification VQC
- Partial retention VQC
- Retention VQC
- No harvest[3]

The findings were as follows:

- Unconstrained harvest could produce 7283 m/yr of timber.
- Modification VQC would provide a maximum attainable harvest of 6150 m/yr.
- Partial retention VQC would provide a maximum attainable harvest of 3010 m/yr.
- Retention VQC would provide a maximum attainable harvest of 356 m/yr.

[3] A Preservation VQC was considered a no harvest scenario in this study because any volume derived through a clearcutting regime would be insignificant.

Data from the Snowdrift Landscape Unit were used to determine VQC percent alteration and green-up age values.[4] An average rotation length of 80 years was assumed, and an average harvest volume of 564 m/ha was calculated from the standing inventory volume of the area. An alternative approach would have been to develop yield estimates of second growth from the inventory information. Comparing the yield estimate in this study (7 m/ha/yr) with the average second growth yields from the Kingcome TSA (TSR 2 analysis 6 m/ha/yr) suggests that the estimate developed in this study is appropriate, given that the TSR 2 yield estimate reflects a significant amount of visual constraint.

6.3 Analysis and Results

The following section describes the Visual Quality Class scenarios and discusses the economic analysis methodology and assumptions. Results are then presented in the following four categories:

1. Resource value
2. Business revenue
3. Government revenue
4. Distributional impacts (employment and income)

The timber volumes modelled reflect the maximum attainable harvest that the area could support under various Visual-Quality Classes and land base constraints. Potential effects on the lodge's business are gleaned from the perception study. Assumptions were made regarding how the lodge's revenues and costs would change under the various scenarios. The perception study found that about 29% of the lodge's guests would not return if the viewscape were managed for partial retention and about 58–65% would not return under modification visual quality. The lodge's repeat customer rate is 72%; subsequently, the repeat customer base could reduce the lodge's business from about 20% under the partial retention class to 43 under the modification class. New customers would initially fill some or all of the lost business, but this may not be sustainable over the longer term, although new customers may be unaware of the alterations and could respond differently than previous guests. In order to provide information over the broader range of possibilities, lodge business impacts were modelled between 0% and 50% for these two visual quality scenarios. A full range of values for each visual quality scenario and value category can be found in Appendix 7.

Five Visual Quality Class scenarios were assessed based on a range of potential lodge business impacts, as follows:

1. **Unconstrained harvest** (UH) volume of 7283 cubic metres/year — This is the maximum amount of timber that the area could support. It is assumed that the lodge would not operate under this scenario.
2. **Modification harvest** (M) regime with an annual volume of 6150 cubic metres — It is assumed under this scenario that the lodge's business may decline by three magnitudes: 10%, 25%, or 50%. Scenarios are labelled M-10, M-25, and M-50.
3. **Partial retention** (PR) harvest regime with a total annual volume of 3010 cubic metres — It is assumed under this scenario that the lodge's business may decline by three magnitudes: 0%, 10%, or 25%. Scenarios are labelled PR-0, PR-10, and PR-25.
4. **Retention** (R) regime in which 356 cubic metres would be available for harvest — It is assumed that the lodge's business would not be affected under this scenario.
5. **No harvest** (NH) scenario where only the lodge business derives value from the viewscape.

The analysis also examined the trade-offs associated with the specific viewscape visible from the lodge. Limiting the viewscape to this area reduces the annual unconstrained harvest volume to 2390 cubic metres, the modification harvest volume to 2017 cubic metres, the partial retention harvest volume to 977.5 cubic metres, and the retention harvest volume to 115.7 cubic metres. This more focused assessment assumes that the lodge is particularly dependent on the smaller viewscape and that other surrounding areas could be logged without additional visual quality constraints that may not be realistic. Results of this analysis are presented in each value category.

Two main areas of uncertainty associated with the analysis are: 1) the lodge's dependence on the size of viewscape identified; and 2) the sensitivity of the

[4] A green-to-operable correction factor was not applied to VQC percent alteration figures because the majority of the viewshed was operable.

lodge's business to changes in its viewscape. In addition, it may be possible to offset the deficit by harvesting at a higher rate elsewhere in the TSA. To provide some context, the unconstrained harvest volume accounts for about 0.5% of the total Kingcome TSA allowable annual cut of 1.33 million cubic metres.[5]

Lodge data used in the trade-off assessment were obtained from the Nimmo Bay Lodge. Forestry data were obtained from: the B.C. Ministry of Forests; Price, Waterhouse, Coopers; and Statistics Canada. Specific citations are noted below as necessary.

The results are based on an assessment of partial net present values and an economic impact analysis of each Visual Quality Class identified above. The analysis is considered to be a partial net present value assessment as not all costs and benefits are considered. Estimates calculated for resource value, or rent, are, by definition, net values reflecting revenues less costs. However, estimates of business revenue and government revenue, as the terms suggest, model revenue streams only.

Discounted net present values are used here to provide a longer-term assessment of trade-offs between the various harvest levels and lodge operations. Discount rates of 5 and 10% were used, although the time frame for each sector is the same, rendering the sensitivity analysis moot. Discounting allows the future streams of income to be compared in today's dollar terms, thus eliminating any time-related differences in revenue streams. To simplify the analysis a 20-year term was used; however, in reality the life of the lodge may well be different than the flow of timber. To illustrate this effect, a paragraph at the end of the resource value section is devoted to discussing the effects of time on value.

Due to the uncertainty surrounding the potential marginal impact that harvesting in the viewscape may have on the lodge's operation, the estimates of present value are based on a linear and non-linear assessment. This approach addresses the potential that the lodge's variable costs may not decline by the same proportion as a change in the number of visitors and business revenue. The linear and non-linear assessments are based on the following assumptions:

1) Linear change — a 10, 25 or 50% reduction in guests leads to a 10, 25, or 50% reduction in costs and revenues
2) Non-linear change — a 10% reduction in guests leads to a 5% reduction in costs, a 25% reduction in guests leads to a 15% reduction in costs, and a 50% reduction in guests leads to a 25% reduction in costs

Figure 17 provides a conceptual diagram of the analysis framework.

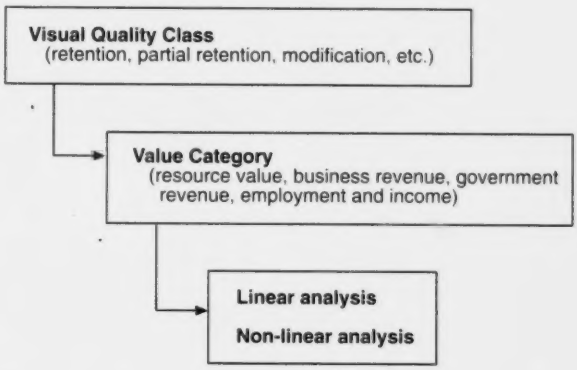


Figure 17. *Evaluation framework.*

Sensitivities to some of the assumptions are also tested using a range of stumpage rates, forest product values, and harvest rates. For each of the categories, results are included in the discussion where significance was found.

Distributional, or employment and income, impacts were also estimated, but only in terms of current annual direct employment that could be supported by each sector. The analysis is based on employment estimates obtained from the lodge operation, and a logging and forestry services direct employment coefficient of 0.45 person-years/1000 cubic metres for forestry impacts.[6] Employment estimates for both sectors are in person-years of direct employment. No multiplier analysis was undertaken.

---

[5] The allowable annual cut for the Kingcome TSA was reduced under Section 173 of the *Forest Act* on July 3, 2002 by 44,000 cubic metres.

[6] B.C. Ministry of Forests. 2001. Timber Supply Review: Kingcome Timber Supply Area Analysis Report. Victoria, B.C.

There are various other assumptions used in this analysis:

1. The stumpage rate used for timber revenue to the Crown is $\$25.83/m^3$ ($Cdn 2001), which is a 5-year average from 1997 to 2001.[7] This value is used as an indicator of resource value or rent and as one source of government revenues.
2. The resource value of the lodge operation was based on a residual value equalling total revenue less total costs and less 10% of revenue to account for profit and risk.
3. The value of the lodge product is based not only on the viewscape, but also on the other activities and services provided. The full resource and revenue value of the lodge may not be attributable to the viewscape alone. However, it is assumed in this analysis that altering the viewscape is sufficient to affect business levels and is an appropriate indicator.
4. To determine forestry revenue, a 5-year average value of shipments for lumber and newsprint (1997–2001) was used: $\$189.93/m^3$ ($Cdn 2001).[8] This value may not specifically reflect the timber profile and products produced, but it provides an indication of the average value to expect for the use of timber through the production process.
5. Other forest industry tax is based on an average of $\$7.77/m^3$ and includes corporate income tax, provincial sales tax, property tax, electricity tax, logging tax, and corporation capital tax paid to British Columbia.[9]
6. Forestry employment is estimated for logging and forestry services, based on a labour-harvest coefficient of 0.45 person-years/1000 m^3 harvested.[10] It is assumed that the small volume of timber in each scenario is not sufficient to either increase or decrease the level of milling activity, although it is acknowledged that smaller local mills could certainly use the timber.
7. In order to examine revenue effects over time, present value estimates were calculated over a 20-year time frame using 5% and 10% discount rates.
8. The maximum number of guests that the lodge can handle is 500 a year.
9. It is assumed that the current guest rate will not change, nor will stumpage and product values for forestry products.
10. A person-year is defined as a full-time job lasting at least 180 days a year.
11. The average annual pre-tax income rate, not including benefits, for logging and forestry services is $49,400.[11] The average wage at the Nimmo Bay Lodge is $25,000 for a 100-day operating season.

Determining the optimal solution (which visual quality regime "best meets" multiple resource management objectives) is based on which option maximizes the total combined value of the two sectors. While cost-benefit analysis suggests that the optimal choice should be based on residual or resource values, the uncertainty associated with the resource value estimates in this analysis prompted an examination of a number of indicators. Assessment of the optimal choice is based on both the value results and a consideration of uncertainty and risk.

The following results are illustrative and should not be used as a definitive argument for timber or the operation of a tourism lodge. The assessment provides an illustration of the potential balance and enhanced benefits that may be possible by managing the resource for multiple values. It also highlights

---

7 Revenue Branch, B.C. Ministry of Forests, 1997–2001. Stumpage rate is for the Kingcome Timber Supply Area. In comparison, van Kooten and Bulte (1999) determined an average rent of $\$30/m^3$ for old-growth timber on the coast of British Columbia. The current average 2002 stumpage rate (to June 2002) for the Port McNeill forest district is $\$20.94/m^3$ and up to $\$36.88/m^3$ for the specific licence area. In contrast, the stumpage rate for the specific licence area in 2000 was $\$11.96/m^3$. The analysis examines the impact of the management on the timber supply of the timber supply area, as such an average for the district is more appropriate than a rate for an individual licence. The potential annual range in stumpage rates also suggests that a 5-year average is more appropriate than using a rate from a single point in time.

8 Statistics Canada. Monthly Survey of Manufacturers Shipments, V807702 M7677/V1781 D346048.

9 PriceWaterhouseCoopers. 1999. The Forest Industry in British Columbia. Vancouver, B.C.

10 B.C. Ministry of Forests. 2001. Kingcome Timber Supply Area Analysis Report, Victoria, B.C.

11 Statistics Canada, Survey of Employment Payrolls and Hours. L686580:04428 SEPH B.C. AWE INCL O/T ALL EMPL ANNUAL LOGGING & FORESTRY. Note: this is an average rate and many specific jobs will have higher wages.

topics for further research that should be addressed before this model is used for other similar applications, or as a broader, decision-making tool. The assessment results are presented in the following order: resource value, business revenue, government revenues, and distributional impacts. The tables in each section present the results for selected scenarios. All results appear in Appendix 7.

6.3.1 Resource value

Resource value reflects the benefits that society obtains from the use of the resource in a particular manner; for example the forest for its timber or scenic value. Resource value, or resource rent,[12] is a residual value and can be found by subtracting from total revenue all costs associated with producing the good, including an allowance for profit and risk. The figures presented here arguably reflect resource rent as accurately as possible given the available data.
A summary of the main results is presented in point form followed by a more in-depth discussion.

- A PR-0 generates the highest resource value if business at the lodge can be maintained.
- An M-25 generates higher resource value than a PR-10, if lodge costs and revenues decline proportionally.
- A PR-0 or P Visual Quality Class generates higher resource values than an M-25, if the lodge's costs decline by a lower proportion than revenues (i.e., non-linear).
- Results indicate a need to better understand how the lodge's business might be affected by modification and partial retention visual quality objectives. (For example, examine lodges in British Columbia that have experienced significant alteration to see how business has been affected.)

Based on the average stumpage value of $\$25.83/m^3$ and a linear reduction in lodge activity, the maximum resource value is achieved under a partial retention regime (PR-0 scenario) rather than a modification regime. This result is valid only if the lodge's business were to decline under a modification regime by approximately 25% or more (see Table 4 and Appendix 7 for the numeric results and Figure 18 for a graphical presentation). If the partial retention regime were to reduce the lodge's business by 10% (PR-10) or more, then the maximum resource value would be achieved under the modification -25% (M-25) regime. These results hold at either a 5% or 10% discount rate.

Under a non-linear assumption the result is somewhat different, however. In this case, the partial retention, retention, and no harvest scenarios would maximize the overall resource value. Even PR-10 would be preferable if under a modification scenario the change in the lodge's business would be greater than 10%.

The reason for this result is that in the non-linear scenario, lodge revenues decline at a faster rate than costs, leading to lower average resource values from the lodge than under the linear case. Average guest costs rise from $5100 under the linear scenario to $5400 and $5800 under the PR-10 and M-25 non-linear scenarios, respectively. Under the M-50 scenario the model estimates the resource rent from the lodge operation to be less than zero. A change to the discount rate or increase in the stumpage rate does not affect the outcome.

The non-linear assessment is very sensitive to the change in the number of guests at the lodge. The analysis indicates that if the number of guests were to decline by 10% as a result of harvest activity and lodge costs declined by 5%, then moving to a retention class or reducing the harvest to zero and maintaining the operation of the lodge would produce a higher resource value. However, if under a modification class the number of guests at the lodge declined by 10% or less, then the modification scenario is the optimal choice. This is a significant point indicating the importance of correctly understanding the effects that changing the viewscape would have on the lodge's number of guests and fee structure.

One main source of uncertainty is whether or not the viewscape under review is indeed relevant to the resource management question. While a higher timber volume would obviously favour a greater timber emphasis, what if the analysis were limited to the viewshed most important to the operation of the lodge, (i.e., the viewshed facing the lodge)? Examining a smaller area reduces the timber volume,

[12] For a more in-depth introduction to resource rent see Pearse. 1990. Introduction to Forestry Economics. UBC Press, Vancouver, B.C.

Table 4. *Present value of resource value for selected scenarios, by VCC for timber and lodge operation, based on a linear and non-linear assumption, a 20-year time frame, and a 5% discount rate*

	Unconstrained harvest	Modification -25 (M-25)	Partial retention -10 (PR-10)	Partial retention -0 (PR-0)	Retention –0 (R)
Volume (m^3)	7 283	6 150	3 010	3 010	356
Number of guests	0	375	450	500	500
Linear	(5)	(2)	(3)	(1)	(4)
Forestry PV $	2 344 390	1 979 678	968 916	968 916	114 596
Lodge PV $	0	3 439 570	4 127 484	4 586 093	4 586 093
Total PV $	2 344 390	5 419 248	5 096 400	5 555 009	4 700 689
Non-linear	(5)	(4)	(3)	(1)	(2)
Forestry PV $	2 344 390	1 979 678	968 916	968 916	114 596
Lodge PV $	0	252 983	2 534 190	4 586 093	4 586 093
Total PV $	2 344 390	2 232 661	3 503 106	5 555 009	4 700 689

Note: Numbers in brackets indicate rank.

subsequently increasing the share of the lodge's value to overall resource value. PR-0 remains the optimal choice; however, the modification system is now surpassed in value by R, PR-10, and even the no harvest scenario (see Appendix 7). The ranking of scenarios is PR-0, R, no harvest, and PR-10. This indicates that if there is significant uncertainty in the ability of the lodge to maintain business levels under a partial retention system, a retention system is favoured. This limited viewshed analysis assumes that harvesting would continue unrestricted in the remainder of the vicinity (including those areas in the original viewshed analysis). Managing the total viewshed under different Visual Quality Classes may provide an optimal solution.

If the stumpage rate for timber were to rise by 15%, reflecting an increase in product values, the timber resource value would increase to $2,276,630 from $1,979,678, making the M-25 scenario preferable to the PR-0 system. Average stumpage rates have been higher at times; for example, from 1995 to 2001, average stumpage rates ranged from under $20/cubic metre to over $33/cubic metre. For specific species such as cedar, rates have been even higher, although

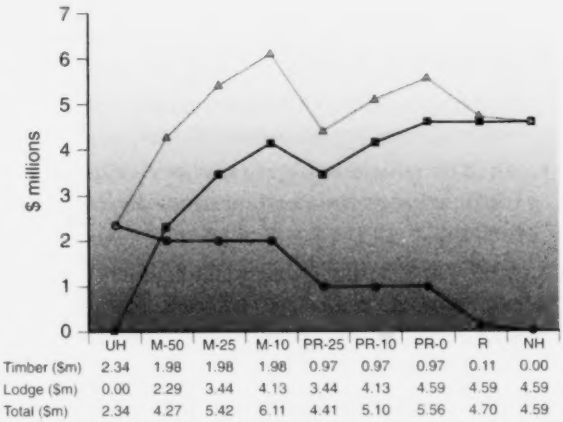


Figure 18. *Present value of resource value, by VQC and lodge business impacts, based on a linear assumption, a 20-year time frame, and a 5% discount rate.*[13]

the average 5-year (1997–2001) stumpage rate for cedar was about $29/cubic metre. If the land use choice was for either timber or the lodge, a harvest of 14,250 cubic metres is the point at which timber would return more than the lodge, well above the

[13] (UH = unconstrained harvest level; M-50 = modification visual quality class with a 50% reduction in lodge business activity; M-25 = modification with 25% reduction; M-10 = modification with a 10% reduction; PR-25 = partial retention with a 25% reduction; PR-10 = partial retention with a 10% reduction; PR = partial retention with no reduction; R = retention with no reduction; and NH = no harvest with no reduction in business activity at the lodge.) Note that while the Figures provide the full range of values, the Tables provide data that reflect the most likely scenarios.

maximum potential volume from the viewscape of 7283 cubic metres.

While the results in Table 4 indicate preferred options under the various assumptions, determining the best choice would ideally benefit from additional research. This research would include: 1) an assessment of the linkage between harvest activity and the lodge's number of expected guests; 2) how a change in the number of guests would affect variable costs; and 3) a more robust estimate of the resource value, or rent, associated with the viewscape.

If the 20-year time frame for each sector is adjusted to reflect potential differences in sector longevity, predictable differences from the results of Table 4 appear. For example, if the time frame for forestry is extended to 30 years and the lodge reduced to 10 years, the assessment results tend to favour a modification Visual Quality Class, especially if PR results in any loss of business at the lodge. These results may also suggest, however, that timber operations should be limited in the first 10 years, then increased to an unconstrained level after the lodge reaches the end of its lifespan. Conversely, if the time frame for the lodge is extended to 30 years and forestry to 10, the results tend to favour partial retention and retention systems. The question remains, however, as to how long the lodge will remain in operation and how long the timber will be available or economic to harvest.

The analysis is sensitive to the assumptions about the level of business impacts that may occur under the modification and partial retention classes. Specifically, how reasonable is it to include the M-10 and PR-25 in the analysis? Given the level of uncertainty, the analysis suggests that partial retention or retention is probably the least risky choice at this time, in terms of maximizing resource values. The analysis also suggests that the area in the viewscape should be managed for visual quality and should not be removed from the timber harvesting land base.

6.3.2 Business revenue

Business revenue is simply the income earned by a sector or business before accounting for costs. A summary of main results is presented in point form followed by more in-depth discussion.

- PR-0 generates the highest business revenue if business at the lodge can be maintained.
- M-25 generates higher business revenue than PR-10 or R.
- PR-10 and R would generate higher business revenue than M-25 if the value of shipments declined by 15–25%.
- Uncertainty and relatively small marginal differences between M-25, PR-10, and R suggest that PR or R visual quality objectives would be least risky.

The revenue assessment indicates that the optimal choice in terms of business revenue would be the PR-0 regime (see Table 5 and Appendix 7 for numeric results and Figure 19 for a graphical presentation). The same holds true for the non-linear assumption. If, however, partial retention were to reduce business at the lodge by 10% or more, the M-25 regime would be the optimal choice. The M-25 scenario also results in higher business revenues than the R scenario. If the viewscape area were larger, or if the current viewscape allowed a harvest rate of about 17,250 cubic metres, a timber-only scenario would return the highest business revenues.

Limiting the analysis to the smaller viewshed immediately facing the lodge favours more stringent visual quality management similar to the previous resource value discussion. Partial retention, retention, and a no harvest scenario tend to return the highest business revenue. This is due to the smaller area under assessment and the much lower volume of timber available for harvest.

Because the analysis indicates the same conclusions under the linear and non-linear assumptions, Table 5 is used to illustrate the sensitivity to the value of forestry shipments. A PR-10 scenario would return higher revenues than an M-25 if the value of shipments declined by about 15%. An R scenario would return higher revenues than an M-25 scenario if the value of shipments declined by about 25%. Conversely, for an M-25 scenario to return higher revenues than PR-0, the value of shipments would have to rise by about 35% to $260/cubic metre.[14]

From 1991 to 2000, the real value of shipments (i.e., adjusted for inflation) increased by an average rate of 7% a year. The value of shipments and lodge fees are

[14] Note that this assumes a longer-term adjustment in the average value of shipments and not a yearly fluctuation.

Table 5. *Present value of business revenue for selected scenarios by VQC for timber and lodge operation, based on a linear assumption, a 20-year time frame, and a 5% discount rate*

	Unconstrained harvest	Modification -25 (M-25)	Partial retention -10 (PR-10)	Partial retention -0 (PR-0)	Retention (R)
Volume (m^3)	7 283	6 150	3 010	3 010	356
Number of guests	0	375	450	500	500
Forestry value of shipments = 100%, \$189.93/m^3		(2)	(3)	(1)	(4)
Forestry revenue PV	17 238 479	14 556 728	7 124 512	7 124 512	842 633
Lodge revenue PV	0	30 376 638	36 451 965	40 502 184	40 502 184
Total revenue PV	17 238 479	44 933 366	43 576 478	47 626 696	41 344 817
Forestry value of shipments = 76%, or \$140		(4)	(2)	(1)	(3)
Forestry revenue PV	12 706 719	10 729 963	5 251 575	5 251 575	621 117
Lodge revenue PV	0	30 376 638	36 451 965	40 502 184	40 502 184
Total revenue PV	12 706 719	41 106 601	41 703 540	45 753 759	41 123 301

Note: Numbers in brackets indicate rank.

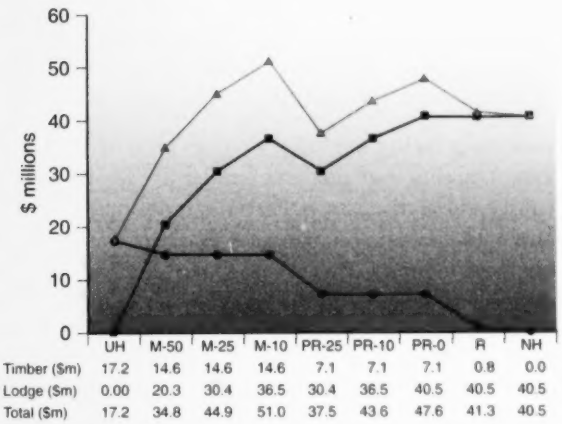


Figure 19. *Present value of business revenue, by VQC and lodge business impacts, based on a linear assumption, a 20-year time frame, and a 5% discount rate.*

assumed to remain constant in this analysis. Although the increasing value does raise some uncertainty regarding the assumption that both the lodge and forest products values would remain proportionally the same or would increase at the same rate, faster-rising values for timber would favour the M scenarios and a greater timber emphasis.

6.3.3 Government revenues

Government collects revenues in the form of taxes and resource rents. Main results are summarized in point form followed by more in-depth discussion:

- Government revenues are maximized at an M-25 scenario;
- PR-0 would maximize government revenues if stumpage rates declined by about 50%;
- PR would maximize government revenues if a modification system were to result in a loss of business at the lodge of greater than 25%;
- A retention system would result in 42% less government revenues than an M-25 system;
- Uncertainty associated with the effects of an M Visual Quality Class on the lodge's business increases risk.

The government revenue assessment indicates that based on the various assumptions, the highest government revenues are generated at the M–25 scenario (see Table 6 and Appendix 7 for numeric results and Figure 20 for a graphical presentation). This result holds under both the linear and non-linear assumptions. If the viewscape area were larger, or if the current viewscape allowed a harvest rate of about 8500 cubic metres, a timber-only scenario would return the highest level of government revenues. For a

Table 6. *Provincial government revenue for selected scenarios, by VQC for timber and lodge operation, based on a linear and non-linear assumption, a 20-year time frame, and a 5% discount rate*

	Unconstrained harvest	Modification -25 (M-25)	Partial retention -10 (PR-10)	Partial retention -0 (PR-0)	Retention (R)
Volume (m^3)	7 283	6 150	3 010	3 010	356
Number of guests	0	375	450	500	500
Linear	(5)	(1)	(3)	(2)	(4)
Forestry PV $	3 049 613	2 575 191	1 260 378	1 260 378	149 068
Lodge PV $	0	2 635 757	3 162 909	3 514 343	3 514 343
Total PV $	3 049 613	5 210,949	4 423 287	4 774 721	3 663 411
Non-linear		(1)	(3)	(2)	(4)
Forestry PV $	3 049 613	2 575 191	1 260 378	1 260 378	149 068
Lodge PV $	0	2 987 192	3 338 626	3 514 343	3 514 343
Total PV $	3 049 613	5 562 383	4 599 004	4 774 721	3 663 411

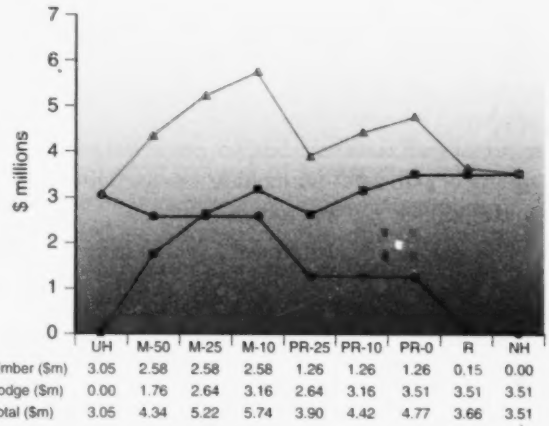
Numbers in brackets indicate rank.

partial retention system to return higher revenues to government, stumpage rates would have to drop by about 25%.

These results are due to the large percentage of stumpage payments to total government revenue. As a result, moving to a lower harvest level, such as moving from M-25 to PR-0, reduces revenues by about one half, with a lower concurrent increase from the lodge operation. Specifically, government revenue would drop by approximately $1.3 million while lodge-related revenues would increase only by approximately $878,000.

Partial retention would be the most beneficial choice if the modification system were to cause a reduction in business of 50%, or, obviously, if it were to cause the lodge to close. Timber revenues alone, even at the unconstrained harvest level of $3,049,613 (see Appendix 7, Table A7.3) do not reach the level of government revenues that would be forthcoming under a partial retention system and a sharing of the resource. In fact, operating the lodge alone would generate more government revenues if the choice were between the lodge and harvesting.

An examination of the limited viewshed facing the lodge results in the most significant change to the government revenue assessment. Under this more limited viewshed analysis, M-25 returns lower revenues than PR-0, PR-10, R, and a no harvest scenario (see Appendix 7 for numeric results). Once again, this



	UH	M-50	M-25	M-10	PR-25	PR-10	PR-0	R	NH
● Timber ($m)	3.05	2.58	2.58	2.58	1.26	1.26	1.26	0.15	0.00
■ Lodge ($m)	0.00	1.76	2.64	3.16	2.64	3.16	3.51	3.51	3.51
▲ Total ($m)	3.05	4.34	5.22	5.74	3.90	4.42	4.77	3.66	3.51

Figure 20. *Provincial government revenue, by VQC and lodge business impacts, based on a linear assumption, a 20-year time frame and a 5% discount rate.*

result assumes that the broader area and remainder of the original viewshed is not managed under the more restrictive visual quality constraints.

Note that the lodge operator does not pay resource rent, as does the timber operation through stumpage charges. Stumpage is the revenue the owner of the resource (in this case the Crown) receives for providing the rights to harvest the timber. Collecting no stumpage for timber would be analogous to providing one's labour for free, or not charging for a piece of lumber used in the manufacture of furniture. If the

lodge operator were charged a resource rent similar to stumpage (for the use and profit of the viewscape and other amenities), the contribution of the lodge to government revenues would increase and, depending on the level of rent, may make partial retention, and even retention, more attractive over the modification system.

As with the other assessment categories, further analysis of the way in which the lodge's business would be affected by a modification system is required before making a more definitive conclusion.

6.3.4 Distributional impacts

Distributional impacts (indicated by employment and income in this analysis) deal with equity issues and not net benefits or a maximization of society's welfare. Employment and income, however, remain important considerations for government.

The Nimmo Bay Lodge employs 21 staff. Four staff work year-round in the front office, operations management, and marketing, while the remainder are employed for approximately 100 days a year. There is minimal staff turnover. Employees at the lodge have a variety of skill sets and include service personnel, guides, pilots, and mechanics.

The majority of visitors (94%) come from the United States, with the remainder from Canada and Europe. The lodge offers high-end heli-fishing for salmon in remote rivers, ocean kayaking, river rafting, whale watching, beachcombing, spelunking (exploring caves), and heli-hiking. Prices range from $5000 to $7000 for a 4-day, 4-night stay.

Logging and forestry services employment includes harvesting and silviculture related activities. In a typical coastal operation (cable yarding or helicopter), a harvest of 5000–10 000 cubic metres would involve five to 10 people working 4–6 weeks. These workers will move from location to location during a season, which on the coast can last a full year.

To allow a comparison of employment and income between sectors, part-time employment is converted to person-years. One person-year is equivalent to a job lasting at least 180 days a year. For any given change in employment, converting person-years back to jobs is more difficult and depends on how a company's workforce is structured and responds to any change. For example, less timber available to harvest may result in a logging operation employing its workers for a few days less a year, or it may eliminate a part-time or full-time job, depending on the volume reduction. Using person-years eliminates this uncertainty and allows for a comparison of potential positive or negative impacts. All subsequent references to employment in this section are in terms of person-years.

A summary of results is presented in point form followed by a more in-depth discussion.

- PR-0 supports the maximum employment at 13.4 person-years, followed by PR-10 and R.
- Employment and income from the lodge are 4–12 times larger than from logging and forestry services employment.
- M-25 supports a very similar magnitude of person-years, but is dependent on the ability of the lodge to maintain product and service levels.
- PR and R reduce the risk associated with uncertainty of impacts to the lodge.

As with the other value categories, this analysis depends to a great deal on the way in which the lodge would have to adjust its workforce to a decline in the number of guests. The success of an operation such as the Nimmo Bay Lodge is due not only to its natural setting, but also to the service level provided by staff. Any change to the level of service may affect the value of the tourism product and could compromise the lodge's customer and revenue base. Subsequently, the lodge may not be able to reduce its workforce at all, but, for example, may reduce the number of days in operation.

A reduction in the number of days worked could have several impacts. First, the reduced work-year would lower the total income paid to employees and may cause higher staff turnover, which could affect service levels at the lodge. Second, the reduced income paid to employees would reduce spending on personal goods and services — the so-called induced impact. Finally, a reduced work-year would mean a reduction in the lodge's expenditures on local and provincial supplies of goods and services — the so-called indirect impact. The analysis in this report examines only the direct income and employment effects. These indirect and induced effects will occur as

a result of forestry changes also, and generally by a higher magnitude.[15]

Harvesting 6150 cubic metres of timber can support about three direct person years of logging and forestry services employment (see Table 7). Harvesting a volume of 3010 cubic metres would support less than two person-years of direct employment. These employment estimates are based on the average direct harvesting employment coefficient for the Kingcome TSA of 0.45 person-years/1000 cubic metres.[16] Processing employment is not included in this analysis, as the small volume is unlikely to affect processing activity in the province, although a small mill operator would gladly process the volume. Including timber-processing jobs would increase the forestry employment estimate by approximately two to four person-years of direct employment. To support as much labour and income as the lodge, a harvest rate of over 25,000 cubic metres would be required.

The lodge operation currently supports about 12–13 person-years of direct employment. Person-years were determined by adding the four full-time jobs to the total number of days worked by all part-time employees (1700) divided by a full-time job ranging from 180 to 200 days a year.

Under each scenario, the income from the lodge easily surpasses the income earned through timber harvesting. Obviously, even a doubling of forestry incomes would not affect the outcome. In terms of employment and income, either the PR-0 or a PR-10 scenario would be preferable over an M-25. Including the jobs and income associated with processing suggests that an M-25 scenario would support more employment and income (see Appendix 7). Once again, the difference is marginal and there is some uncertainly with the assumption that the lodge's business would decline by only 25% under a modification visual quality regime.

6.3.5 Summary

Table 8 presents a summary of the total values presented in each of the Tables above. The results appear to favour a partial retention regime. However, differences between the partial retention and modification systems are relatively minor in some cases and any decline in the lodge's operation as a result of partial retention, which is possible given the survey results, could result in a M-25 system being the optimal choice. Of course this assumes that a modification system would result in a maximum 25% reduction in lodge activity. An impact greater than 25% under a modification Visual Quality Class would favour the partial retention and even retention scenarios.

The actual effect of a partial retention or modification system on business at the lodge is uncertain, however, and exposes the lodge to a potentially high level of risk. The resource value, which is an indication of rent, or net benefits to society, indicates that a partial retention and even a retention system may be preferable (see Appendix 7, Table A7.7), if the changes

Table 7. *Employment and income impacts of modification versus partial retention VQC, based on a linear reduction assumption*

	Modification (M-25)		Partial retention (PR-10)		Partial retention (PR-0)		Retention (R)	
Sector	Person-years	Income ($)	Person-years	Income ($)	Person-years	Income ($)	Person-years	Income ($)
Forestry	2.8	135 671	1.4	66 402	1.4	66 402	0.2	7 853
Tourism	9.0	600 939	10.8	721 127	12.0	801 252	12.0	801 252
Total	11.8	736 610	12.2	787 528	13.4	867 654	12.2	809 105

[15] For a discussion of economic multipliers for small areas of British Columbia see Horne, G. 1999. British Columbia local area dependencies and impact ratios – 1996. BC Stats, Ministry of Finance and Corporate Relations, Victoria, B.C.. In the Port McNeill forest district, the logging migration-multiplier is 1.45. In contrast, the tourism migration-multiplier is 1.12 (i.e., the average direct job in tourism supports a further 0.12 indirect and induced jobs, while the average logging and forestry services job supports a further 0.45 indirect and induced jobs in the area).

[16] B.C. Ministry of Forests. 2001. Kingcome Timber Supply Area Analysis Report. Victoria, B.C.

to the lodge's costs do not fall in proportion (i.e., in a non-linear manner) to the reduction in guests.

An M-25 scenario provides the greatest returns to government in the form of taxes and stumpage payments. This result holds under both linear and non-linear analyses, but once again assumes that any reduction to the lodge's business would not exceed 25%. If the lodge were to pay a form of rent to government for the use and profit of the viewshed, the results of the government revenue analysis would favour partial retention and even retention Visual Auality Classes, depending on the level of rent collected.

Table 8. Summary of forestry and lodge trade-off values for selected scenarios

	Modification -25 (M-25)	Partial retention -10 (PR-10)	Partial retention (PR)	Retention (R)
Volume (m^3)	6 150	3 010	3 010	356
Number of guests	375	450	500	500
Linear				
Total Resource Value ($)	5 419 248	5 096 400	**5 555 009**	4 700 689
Total Business Revenue ($)	44 933 366	43 576 478	**47 626 696**	41 344 817
Total Government Revenue ($)	**5 210 949**	4 423 287	4 774 721	3 663 411
Total Income ($)	736 610	787,528	**867 654**	809 105
Non-Linear				
Total Resource Value ($)	2 232 661	3 503 106	**5 555 009**	4 700 689
Total Business Revenue ($)	44 993 366	43 576 478	**47 626 622**	41 344 817
Total Government Revenue ($)	**5 562 383**	4 599 004	4 774 721	3 663 411
Total Income ($)	816 735	827 591	**867 654**	809 105

Note: Numbers in bold indicate highest value. Figures are not additive.

7.0 Conclusion: Balancing Resource Use

The purpose of this research was to illustrate some of the trade-offs of multiple resource use and to identify under which conditions, if any, a balance of uses would return the highest benefits to society. The analysis examines two resource uses: timber harvesting and operating a tourism lodge at Nimmo Bay on British Columbia's inner coast.

The main assumptions affecting the analysis concern how timber harvesting under a particular Visual Quality Class may affect the lodge's business. The perception survey, which forms the basis for this economic analysis, indicates that some lodge guests (20%) may not return under a partial retention system, and even fewer may return under a modification system. The lodge enjoys a high repeat customer rate of 72%, which indicates the relevancy of the guests' survey responses as a reflection of future operations. It is uncertain whether or not the lodge would be able to attract a sufficient number of new clients or would experience a loss of business.

Given the relatively minor difference between the volume of timber available for harvest under modification and partial retention systems, and given the current level of uncertainty associated with the assessment, the least risky decision would be to adopt a partial retention system or even a retention system. Identifying the optimal choice would benefit from further research examining in greater detail the linkages between the level of business activity at the lodge and timber-harvesting activity. This would clarify, among other things, whether the linear or non-linear evaluation is more relevant. Until this additional information is incorporated into the analysis, it is not possible to identify definitively the optimal mix of harvest and lodge activity.

Perhaps even more critical to this and other similar analyses is an accurate assessment of the viewscape critical to the tourism operation and the associated timber volume. For example, in the Nimmo Bay assessment if the timber supply from the area critical to the operation of the lodge were between 8,000 and 25 000 cubic metres (or higher obviously), the values associated with the timber alone would begin to render a decision to accommodate both timber and tourism uneconomic for the province. Thus, it is important that the basic assumption of the area included in the lodge's viewscape and deemed important for its operation is accurate. An assessment of Nimmo Bay's viewscape requirements suggests that a 0.5% reduction in the Kingcome TSA AAC of 1.33 million cubic metres would accommodate the lodge.

Limiting the analysis to just the viewscape visible from the lodge tends to simplify the decision to adopt a more restrictive visual quality management approach, yet how the remainder of the area is managed is still a consideration. As a result, managing the total viewscape identified as important to the lodge by using a range of visual quality constraints may return the greatest level of benefits to society. This argument is made even more persuasive if the tourism operation were to pay some form of rent for the use and profit of this Crown resource.

7.1 Suggested Areas for Future Research

- Investigate how tourism lodges have been affected by harvest-related viewscape alterations in the past in British Columbia.
- Examine in greater detail the linkages between the level of business activity at the lodge and timber-harvesting activity. (For example, what happens as harvesting affects viewscape?)
- Investigate how the size of a viewshed affects the revenues between forestry and tourism in a given TSA.
- Assess what level of flexibility exists to shift short-term harvest levels to less sensitive areas in a TSA that are constrained by VQOs and still meet AAC levels.
- Examine the economic effects of using alternative silvicultural systems to achieve visual quality.

7.2 Study Limitations

- The results and conclusions of this study apply to the Nimmo Bay Lodge only.
- Assumptions regarding return visits to the lodge were a best estimate given perception survey response to question 1, part 3. It may be that one photo of each class was not enough.
- Many of the people visiting the lodge are sent by large corporations that ultimately pay the invoice. The fact that someone else is paying the bill could affect client return rates.

- It may be possible that the current standing inventory of the Nimmo Bay area is greater than the 564 m^3/ha calculated.
- The timber supply analysis was restricted to current management as modelled in the Kingcome Timber Supply analysis. Modelling a selection or retention silvicultural system would produce greater timber volumes for the same VQOs.
- The assumption was made that timber harvesting would be economical at all levels of visual constraint. In reality there is a threshold at which the lower volume available in each entry under the higher visual constraints would not offset the cost of development and access.
- It may be that the lodge is dependent on a larger viewscape for its business than was analyzed.

8.0 Glossary

Clearcut: a silvicultural system that removes the entire stand of trees in a single harvesting operation from an area that is 1 ha or greater, and at least two tree-heights in width, and is designed to manage the area as an even-aged stand.

Existing Visual Condition (EVC): a component of the visual landscape inventory that presents the level of human-made landscape alterations caused by resource development activities and expressed in terms of the Visual Quality Objective categories (see Visual Quality Objective).

Hand logging (HL): is a method of harvesting timber in which loggers use jacks and small winches to manually move felled timber. Hand logging often occurs along shorelines, and openings are usually small and non-intrusive.

Natural disturbance (ND): is used in the context of this study to describe natural scenes with no human disturbances. Some scenes contained natural disturbances such as slide tracks.

Partial cut: a general term referring to silvicultural systems other than clearcutting, in which only selected trees are harvested. Partial cutting systems include seed tree, shelterwood, selection, clearcutting with reserves, and retention.

Percent alteration: the scale of human alteration to the landscape, including cutblocks, expressed as a percentage of a landform or the total scene.

Public acceptance rating (PAR): a measure of the lodge patrons' "acceptance" of visual quality in this study.

Retention system: a silvicultural system that is designed to retain individual trees or groups of trees to maintain structural diversity over the area of the cutblock for at least one rotation, and leave more than half the total area of the cutblock within one tree-height from the base of a tree or group of trees, whether or not the tree or group of trees is inside the cutblock.

Scenic area: any visually sensitive area or scenic landscape identified through a visual landscape inventory or planning process carried out or approved by the district manager.

Viewshed: a physiographic area composed of land, water, biotic, and cultural elements that may be viewed and mapped from one or more viewpoints and that has inherent scenic qualities and/or aesthetic values as determined by those who view it.

Visual Landscape Inventory: the identification, classification, and recording of the location and quality of visual resources that may be problematic if not managed to the concepts, principles, and practices set out in the visual resource management process.

Visual Quality: the character, condition, and quality of a scenic landscape or other visual resource and how it is perceived, preferred, or otherwise valued by the public.

Visual Quality Class (VQC): a classification that refers to the character and/or condition of the visual resource and is described using the same terminology as Visual Quality Objectives.

Visual Quality Objective (VQO): a resource management objective established by the district manager or contained in a higher-level plan that reflects the desired level of visual quality based on the physical characteristics and social concern for the area.

The specific VQO classes are defined as follows:

Preservation - no visible alterations.

Retention - human-caused alterations are visible but not evident.

Partial retention - human-caused alterations are evident but subordinate and not dominant.

Modification - human-caused alterations are dominant but have natural-appearing characteristics.

Maximum modification - human-caused alterations dominate and are out of scale.

Visual Resource: the quality of the environment as perceived through the visual sense only.

Visual Resource Management: the identification, assessment, design, and manipulation of the visual features or values of a landscape, and the consideration of these values in the integrated management of provincial forest and rangelands.

Visual Sensitivity Class: a component of the visual landscape inventory that rates the sensitivity of the landscape based on biophysical characteristics and viewing and viewer-related factors.

Visually Sensitive Areas: viewsheds that are visible from communities, public use areas, and travel corridors — including roadways and waterways — and any other viewpoint so identified through referral or planning processes.

9.0 References

British Columbia Ministry of Forests. 1996. Clear cutting and visual quality: a public perception study. Range, Recreation and Forest Practices Branch, Victoria, B.C.

———. 1997. Visual impacts of partial cutting. Forest Practices Branch, Victoria, B.C.

———. 2001. Kingcome Timber Supply Area Analysis Report. Victoria, B.C.

Gregory, G.R. 1987. Resource economics for foresters. John Wiley & Sons, New York, N.Y.

Horne, G. 1999. British Columbia local area dependencies and impact ratios – 1996. BC Stats, Ministry of Finance and Corporate Relations, Victoria, B.C.

Nemec, A. 2001. Nimmo Bay Lodge Public Perception Survey statistical summary and analysis of results. Victoria, B.C.

Pearse, P. 1990. Introduction to Forestry Economics. UBC Press, Vancouver, B.C.

Price, Waterhouse, Coopers. 1999. The Forest Industry in British Columbia. Vancouver, B.C.

Statistics Canada. Monthly Survey of Manufacturers Shipments, as quoted in COFI (2001)

British Columbia Forest Industry Statistical Tables.

Van Kooten, G.C. and E. Bulte. 1999. How much primary coastal temperate rain forest should society retain? Carbon uptake, recreation, and other values. Canadian Journal of Forest Research 29: 1879–90.

Appendix 1 Public perception survey response form and questionnaire

Part 1 – Photography Survey

For each of the following slides please rate how acceptable/unacceptable you find the visual quality. Rate each of the scenes on a scale from –3 (which is Very Unacceptable) to +3 (which is Very Acceptable). The mid-point is 0. Next to each line on your response sheet there is a blank space where you can write a comment, word, or phrase to describe what influenced your rating of each slide. Repeating phrases or words is okay, and if nothing comes to mind, then just leave this space blank.

FOR THE PURPOSE OF THIS SURVEY, VISUAL QUALITY CAN BE CONSIDERED THE ATTRACTIVENESS OF THE SCENERY AS IT WOULD AFFECT YOUR ENJOYMENT OF IT.

Slide #	*Very Unacceptable*	*Neutral*	*Very Acceptable*	*Comments*
1	-3 -2 -1 0 1 2 3			
2	-3 -2 -1 0 1 2 3			
3	-3 -2 -1 0 1 2 3			
4	-3 -2 -1 0 1 2 3			
5	-3 -2 -1 0 1 2 3			

Slide #	*Very Unacceptable*	*Neutral*	*Very Acceptable*	*Comments*
6	-3 -2 -1 0 1 2 3			
7	-3 -2 -1 0 1 2 3			
8	-3 -2 -1 0 1 2 3			
9	-3 -2 -1 0 1 2 3			
10	-3 -2 -1 0 1 2 3			

Slide #	*Very Unacceptable*	*Neutral*	*Very Acceptable*	*Comments*
11	-3 -2 -1 0 1 2 3			
12	-3 -2 -1 0 1 2 3			
13	-3 -2 -1 0 1 2 3			
14	-3 -2 -1 0 1 2 3			
15	-3 -2 -1 0 1 2 3			

Slide #	*Very Unacceptable*	*Neutral*	*Very Acceptable*	*Comments*
16	-3 -2 -1 0 1 2 3			
17	-3 -2 -1 0 1 2 3			
18	-3 -2 -1 0 1 2 3			
19	-3 -2 -1 0 1 2 3			
20	-3 -2 -1 0 1 2 3			

Economic Benefits of Managing Forestry and Tourism at Nimmo Bay

Slide #	Very Unacceptable	Neutral	Very Acceptable	Comments
21	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
22	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
23	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
24	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
25	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			

Slide #	Very Unacceptable	Neutral	Very Acceptable	Comments
26	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
27	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
28	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
29	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
30	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			

Slide #	Very Unacceptable	Neutral	Very Acceptable	Comments
31	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
32	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
33	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
34	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
35	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			

Slide #	Very Unacceptable	Neutral	Very Acceptable	Comments
36	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
37	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
38	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
39	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
40	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			

Slide #	Very Unacceptable	Neutral	Very Acceptable	Comments
41	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
42	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
43	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
44	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
45	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			

Slide #	Very Unacceptable	Neutral	Very Acceptable	Comments
46	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
47	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
48	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
49	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			
50	0—0—0—0—0—0—0 -3 -2 -1 0 1 2 3			

Part 2— Demographic Information

Please take a few minutes to fill out this questionnaire. All your answers will be kept confidential and anonymous.

1. **Is your age**

   ☐ Less than 20 ☐ 20-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ 60-69 ☐ 70 plus

2. **Are you**

   Male ☐ Female ☐

3. **What is the highest level of education that you have attained?**

   Check the highest level.

   ☐ Some Elementary
   ☐ Elementary
   ☐ High School
   ☐ College/Technical Diploma
   ☐ University – Bachelors
   ☐ University – Masters/PhD

4. **Where are you from?**

   ☐ British Columbia
   ☐ Other Canadian Province _____
   ☐ USA (List State) _____
   ☐ United Kingdom
   ☐ Europe (List Country) _____
   ☐ Australia
   ☐ Other _____

5. **Where do you live?**

   Place Name_____

☐ Rural Area	less than 2500 people
☐ Town	2500 – 24 999
☐ City	25 000 – 249 999
☐ Large City	250 000 or more people

6. **What is your occupation?**

   _____

7. **What was your primary reason for visiting this lodge?**

   ☐ Sport Fishing ☐ Rafting ☐ Kayaking ☐ Scenery ☐ Wildlife Viewing

Part 3 – General Information

1. Pretend that the five practice slides are the landscape outside this lodge.
   Record whether you would be willing to return to the lodge if this were the scenery.

P1	Yes ☐	No ☐	Undecided ☐
P2	Yes ☐	No ☐	Undecided ☐
P3	Yes ☐	No ☐	Undecided ☐
P4	Yes ☐	No ☐	Undecided ☐
P5	Yes ☐	No ☐	Undecided ☐

2. What in the slides did you like least?

3. What in the slides did you like most?

4. In what circumstances do you think it is more important to preserve the scenery than harvest the timber?
   - ☐ Where scenery is important for a recreation experience.
   - ☐ Where it is critical to the success of a Wilderness Tourism Operation.
   - ☐ Where the financial gain of preserving the landscape outweighs the benefits of harvesting the timber.
   - ☐ There are no circumstances where scenery would have more value than timber.
   - ☐ Other _____

There is space for additional comments below.

Thank you for taking time to participate in this survey.

Appendix 2 Landscapes evaluated by participants in Nimmo Bay public perception survey

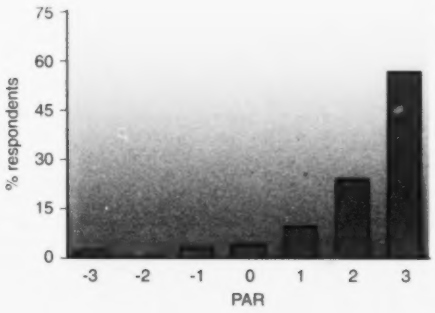
Order of Presentation	Nimmo Bay Study Slide #	Clearcutting Study Slide #	Partial Cutting Study - Public Perception Slide #	Partial Cutting Study - Analysis Slide #	Visual Quality Class (VQC)	Silvicultural System	Location	Unit Alteration (% area)	Volume Removed (%)	Stems Removed (%)	Clearcutting Study - Average PAR (translated)	Partial Cutting Study - Average PAR (translated)	Nimmo Bay Study - Average PAR
1	P1	53	-	-	M	CC	Nancy Greene Lake	21.9	-	-	-0.73	-	-1.30
2	P2	18	-	-	R	CC	North Gulf Islands	0.9	-	-	1.32	-	0.21
3	P3	-	-	-	M	VR	McGillvary Lake	-	-	-	-	-	-0.99
4	P4	-	-	-	P	n/a	Clayoquot Sound	-	-	-	-	-	1.42
5	P5	54	-	-	PR	CC	Nancy Greene Lake	5.3	-	-	0.11	-	-0.30
6	1	-	-	-	PR	VR	Block 1103, Eve River	-	-	-	-	-	-1.14
7	2	-	6	-	PR	CC	Highway 16	3.6	-	-	-	-0.38	-0.92
8	3	-	-	-	R	HL	Dean Channel, Bella Coola	-	-	-	-	-	1.03
9	4	-	-	-	P	ND	Clayoquot Sound	-	-	-	-	-	-0.53
10	5	-	-	72	PR	PC	Block 109, Great Central Lake	-	70	74.4	-	-	0.21
11	6	-	-	66	R	PC	Orchard Lake	-	19	35.4	-	-	1.39
12	7	-	-	-	PR	VR	Kitchener, Highway 95	-	-	-	-	-	-0.78
13	8	-	9	9	PR	PC	Cape Horne	-	81	81.9	-	0.95	1.59
14	9	-	-	-	M	VR	Block 2111, Red Baron Creek	-	-	-	-	-	-2.50
15	10	-	24	14	M	PC	Dayton Creek	-	89	95.2	-	0.06	-0.17
16	11	-	-	-	P	n/a	Mt. Colnett, Meares Island	-	-	-	-	-	2.05
17	12	62	41	-	M	CC	Nahmint Lake	5.6	-	-	0.53	0.41	-0.94
18	13	10	48	-	R	CC	Princess Louisa Inlet	0.6	-	-	2.21	1.03	2.08
19	14	-	27	34	M	PC	Rawlings Lake Road	-	N/A	N/A	-	0.08	-0.16
20	15	-	47	10	M	PC	Scorpion Creek	-	87.7	96	-	0.06	0.93
21	16	-	-	-	M	CC	Nimpkish Lake	5.7	-	-	-	-	-1.69
22	17	-	4	29	PR	PC	Heffley Lake, Kamloops	-	73.6	88	-	1.28	0.28
23	18	-	-	-	PR	CC	Hudson Bay Mountain	7.5	-	-	-	-	0.57
24	19	-	-	-	M	VR	Block 2112, Red Baron Creek	-	-	-	-	-	-2.38
25	20	-	-	-	M	Road	Queen Charlotte Islands	-	-	-	-	-	-1.28
26	21	-	-	-	M	Road	Sproat Lake	-	-	-	-	-	-1.63
27	22	-	-	-	PR	HL	Mid Coast District	-	-	-	-	-	0.46
28	23	-	-	-	M	CC	Craigellachie, Salmon Arm	5.9	-	-	-	-	-1.29
29	24	-	-	-	M	CC/SD	Unit 14, ICHmw2	-	-	-	-	-	-2.53
30	25	-	-	-	P	n/a	Kennedy Lake, Highway 4	-	-	-	-	-	2.19
31	26	-	61	12	PR	PC	Springer Creek	-	89	91.6	-	1.10	1.07
32	27	-	1	5	R	PC	Whatshan Lake	-	75.9	N/A	-	1.69	1.27
33	28	-	12	30	M	PC	Ratnip	-	88.2	99.7	-	-0.31	-1.54
34	29	-	-	-	M	CC	Marvinas Bay	12	-	-	-	-	-2.23
35	30	-	45	27	R	PC	Falkland	-	57.7	42.8	-	0.91	0.16
36	31	64	-	-	R	CC	Warn Bay, Clayoquot	0.9	-	-	1.63	-	1.07
37	32	-	-	-	PR	CC	McKay Island, Clayoquot	2	-	-	-	-	0.41
38	33	-	-	-	PR	CC	Lava Lake	2.8	-	-	-	-	-1.83
39	34	-	19	32	M	PC	Allendale Road	-	64.4	98.6	-	0.30	0.01
40	35	-	-	67	R	PC	Skwaam Bay	-	46.2	74.7	-	-	0.92
41	36	-	3	-	PR	CC	Lyell Island, Sedgewick Bay	0.9	-	-	-	0.32	0.49
42	37	-	-	-	PR	VR	Bomby Summit, Highway 3	3.4	-	-	-	-	-1.02
43	38	-	-	-	PR	ND	Clayoquot Sound	-	-	-	-	-	-0.17
44	39	-	-	-	P	N/A	Clayoquot Sound	-	-	-	-	-	1.16
45	40	-	-	-	PR	CC	Riverside Nahmint Lake	0.9	-	-	-	-	-0.86
46	41	-	22	20	R	PC	Vance Creek	-	60.4	80.2	-	1.63	1.88
47	42	-	-	-	PR	CC	Tofino Creek	6.2	-	-	-	-	-0.84
48	43	-	30	1	PR	PC	Beetle	-	43.9	55.5	-	0.36	-0.51
49	44	11	38	-	R	CC	Highway 5, Clearwater	0.3	-	-	2.32	1.14	1.49

Appendix 3 Public acceptance ratings of landscapes

		Percentage of respondents							Number of respondents (N)								Mean
Slide	Rank	-3	-2	-1	0	1	2	3	-3	-2	-1	0	1	2	3	Total	PAR
p1	41	22.9	34.4	18.8	5.2	12.5	5.2	1.0	22	33	18	5	12	5	1	96	-1.3
p2	20	3.1	11.5	26.0	14.6	19.8	15.6	9.4	3	11	25	14	19	15	9	96	0.2
p3	36	18.8	25.0	22.9	14.6	10.4	5.2	3.1	18	24	22	14	10	5	3	96	-1.0
p4	7	1.0	3.1	12.5	7.3	20.8	22.9	32.3	1	3	12	7	20	22	31	96	1.4
p5	27	2.1	25.0	29.2	12.5	13.5	11.5	6.3	2	24	28	12	13	11	6	96	-0.3
1	38	9.4	34.4	33.3	11.5	7.3	3.1	1.0	9	33	32	11	7	3	1	96	-1.1
2	33	14.7	25.3	27.4	15.8	6.3	7.4	3.2	14	24	26	15	6	7	3	95	-0.9
3	13	3.1	5.2	10.4	12.5	25.0	22.9	20.8	3	5	10	12	24	22	20	96	1.0
4	29	15.6	26.0	14.6	11.5	9.4	17.7	5.2	15	25	14	11	9	17	5	96	-0.5
5	20	7.3	10.4	13.5	20.8	26.0	14.6	7.3	7	10	13	20	25	14	7	96	0.2
6	8	1.0	2.1	7.3	14.6	17.7	36.5	20.8	1	2	7	14	17	35	20	96	1.4
7	30	10.4	20.8	27.1	29.2	5.2	5.2	2.1	10	20	26	28	5	5	2	96	-0.8
8	5	3.1	1.0	6.3	4.2	24.0	31.3	30.2	3	1	6	4	23	30	29	96	1.6
9	48	72.3	16.0	6.4	2.1	1.1	1.1	1.1	68	15	6	2	1	1	1	94	-2.5
10	25	5.2	12.5	31.3	15.6	19.8	11.5	4.2	5	12	30	15	19	11	4	96	-0.2
11	3	0.0	1.0	4.2	8.3	10.4	27.1	49.0	0	1	4	8	10	26	47	96	2.1
12	35	9.5	29.5	26.3	18.9	12.6	2.1	1.1	9	28	25	18	12	2	1	95	-0.9
13	2	0.0	1.0	5.2	9.4	7.3	22.9	54.2	0	1	5	9	7	22	52	96	2.1
14	24	6.3	14.6	19.8	25.0	18.8	13.5	2.1	6	14	19	24	18	13	2	96	-0.2
15	34	12.5	20.8	40.6	7.3	11.5	6.3	1.0	12	20	39	7	11	6	1	96	-0.9
16	44	38.5	31.3	10.4	7.3	7.3	3.1	2.1	37	30	10	7	7	3	2	96	-1.7
17	19	1.0	8.3	24.0	24.0	20.8	14.6	7.3	1	8	23	23	20	14	7	96	0.3
18	15	6.3	10.4	18.8	10.4	18.8	9.4	26.0	6	10	18	10	18	9	25	96	0.6
19	47	63.8	22.3	8.5	2.1	1.1	0.0	2.1	60	21	8	2	1	0	2	94	-2.4
20	39	27.1	25.0	20.8	14.6	5.2	3.1	4.2	26	24	20	14	5	3	4	96	-1.3
21	43	30.2	33.3	19.8	10.4	1.0	2.1	3.1	29	32	19	10	1	2	3	96	-1.6
22	17	6.3	12.5	14.6	14.6	16.7	18.8	16.7	6	12	14	14	16	18	16	96	0.5
23	40	21.9	32.3	24.0	4.2	12.5	3.1	2.1	21	31	23	4	12	3	2	96	-1.3
24	49	74.5	16.0	5.3	1.1	0.0	1.1	2.1	70	15	5	1	0	1	2	94	-2.5
25	1	2.1	0.0	3.2	4.2	9.5	24.2	56.8	2	0	3	4	9	23	54	95	2.2
26	11	1.0	4.2	8.3	20.8	20.8	28.1	16.7	1	4	8	20	20	27	16	96	1.1
27	9	2.1	4.2	6.3	11.5	21.9	36.5	17.7	2	4	6	11	21	35	17	96	1.3
28	42	22.1	35.8	25.3	11.6	2.1	2.1	1.1	21	34	24	11	2	2	1	95	-1.5
29	46	56.4	27.7	9.6	0.0	3.2	1.1	2.1	53	26	9	0	3	1	2	94	-2.2
30	22	4.2	11.6	21.1	16.8	25.3	15.8	5.3	4	11	20	16	24	15	5	95	0.2
31	11	1.0	2.1	15.6	15.6	18.8	29.2	17.7	1	2	15	15	18	28	17	96	1.1
32	18	3.1	10.4	17.7	20.8	16.7	21.9	9.4	3	10	17	20	16	21	9	96	0.4
33	45	32.3	40.6	15.6	4.2	5.2	1.0	1.0	31	39	15	4	5	1	1	96	-1.8
34	23	3.1	9.4	26.0	26.0	20.8	9.4	5.2	3	9	25	25	20	9	5	96	0.0
35	14	1.0	1.0	11.5	21.9	28.1	29.2	7.3	1	1	11	21	27	28	7	96	0.9
36	16	2.1	7.4	20.0	18.9	23.2	17.9	10.5	2	7	19	18	22	17	10	95	0.5
37	37	8.3	34.4	32.3	8.3	10.4	5.2	1.0	8	33	31	8	10	5	1	96	-1.0
38	25	3.1	18.8	25.0	18.8	17.7	12.5	4.2	3	18	24	18	17	12	4	96	-0.2
39	10	1.0	3.1	7.3	20.8	24.0	22.9	20.8	1	3	7	20	23	22	20	96	1.2
40	32	14.6	26.0	25.0	10.4	14.6	8.3	1.0	14	25	24	10	14	8	1	96	-0.9
41	4	0.0	1.0	4.2	12.5	14.6	24.0	43.8	0	1	4	12	14	23	42	96	1.9
42	31	10.4	31.3	29.2	5.2	13.5	6.3	4.2	10	30	28	5	13	6	4	96	-0.8
43	28	17.7	18.8	12.5	18.8	17.7	9.4	5.2	17	18	12	18	17	9	5	96	-0.5
44	6	0.0	1.1	7.4	13.7	20.0	34.7	23.2	0	1	7	13	19	33	22	95	1.5

Appendix 4 Photographs used in Nimmo study ordered by PAR

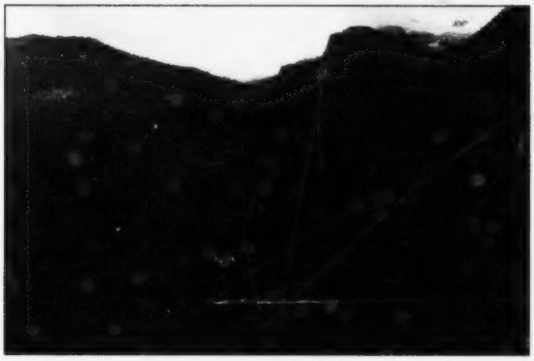
Most preferred to least preferred.

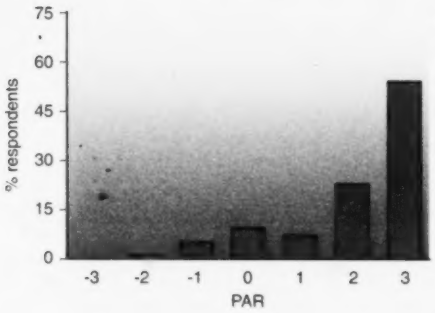


Slide 25

VQC = **P**
Silv. Syst. = n/a

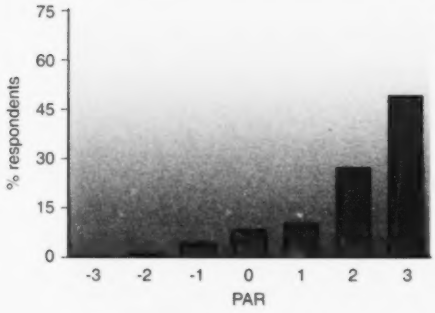
Avg. PAR = **2.19**
Rank = **1**/49
n = **95**





Slide 13

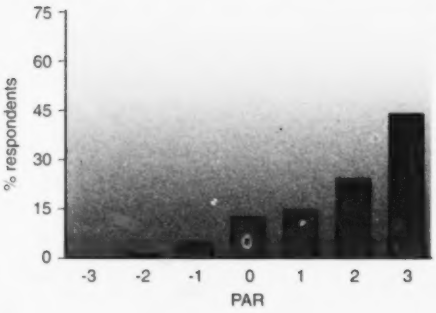
VQC = **R**
Silv. Syst. = **CC**
Alteration = **0.6%**
Avg. PAR = **2.08**
Rank = **2**/49
n = **96**



Slide 11

VQC = **P**
Silv. Syst. = n/a

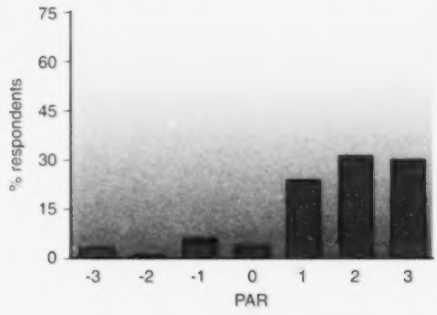
Avg. PAR = **2.05**
Rank = **3**/49
n = **96**



Slide 41

VQC = **R**
Silv. Syst. = **PC**

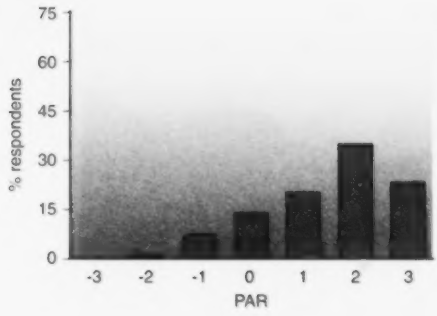
Avg. PAR = **1.88**
Rank = **4**/49
n = **96**



Slide 8

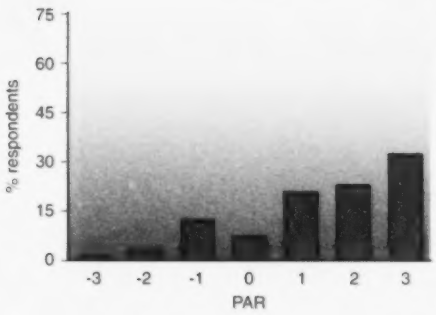
VQC = **PR**
Silv. Syst. = **PC**

Avg. PAR = **1.59**
Rank = **5**/49
n = **96**



Slide 44

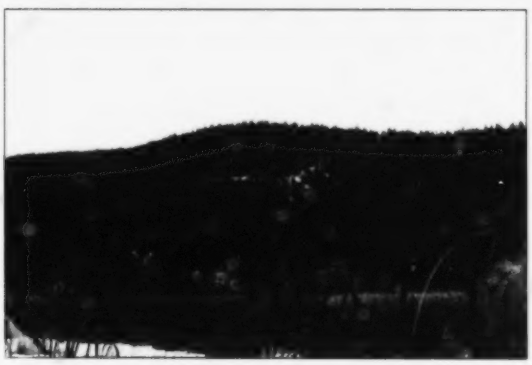
VQC = **R**
Silv. Syst. = **CC**
Alteration = **0.3%**
Avg. PAR = **1.49**
Rank = **6**/49
n = **95**

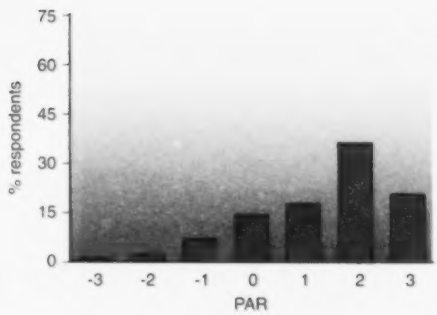


Slide p4

VQC = **P**
Silv. Syst. = n/a

Avg. PAR = **1.42**
Rank = **7**/49
n = **96**

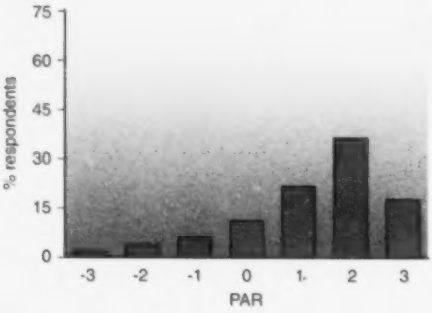




Slide 6

VQC = **R**
Silv. Syst. = **PC**

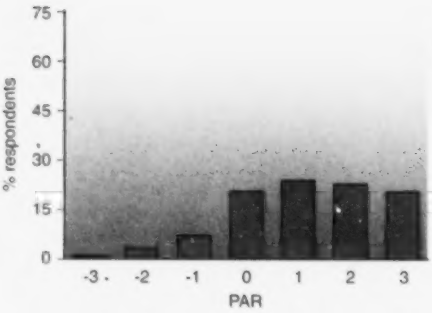
Avg. PAR = **1.39**
Rank = **8**/49
n = **96**



Slide 27

VQC = **R**
Silv. Syst. = **PC**

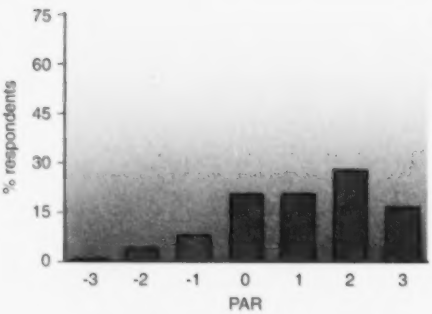
Avg. PAR = **1.27**
Rank = **9**/49
n = **96**



Slide 39

VQC = **P**
Silv. Syst. = n/a

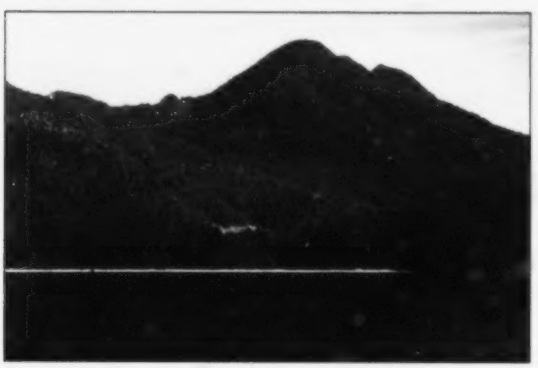
Avg. PAR = **1.16**
Rank = **10**/49
n = **96**

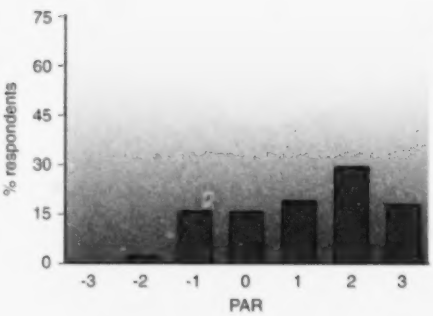


Slide 26

VQC = **PR**
Silv. Syst. = **PC**

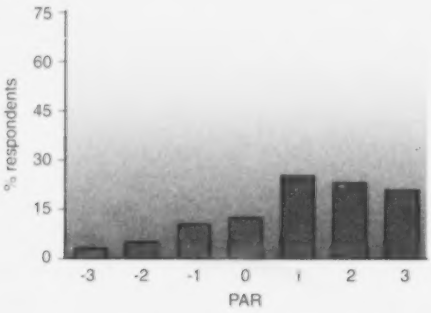
Avg. PAR = **1.07**
Rank = **11**/49
n = **96**





Slide 31

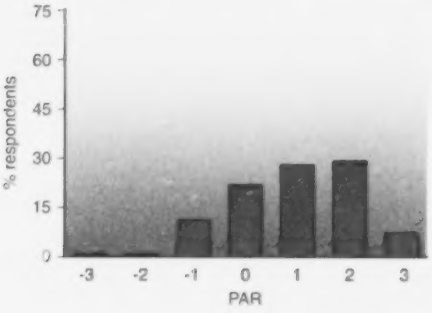
VQC = **R**
Silv. Syst. = **CC**
Alteration = **0.9%**
Avg. PAR = **1.07**
Rank = **11**/49
n = **96**



Slide 3

VQC = **R**
Silv. Syst. = **HL**

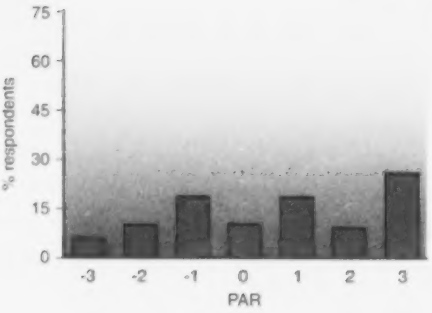
Avg. PAR = **1.03**
Rank = **13**/49
n = **96**



Slide 35

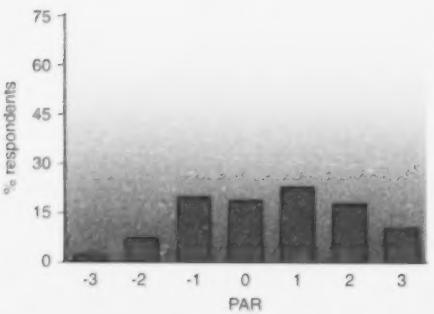
VQC = **R**
Silv. Syst. = **PC**

Avg. PAR = **0.92**
Rank = **14**/49
n = **96**



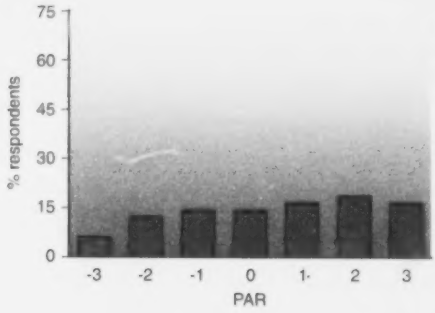
Slide 18

VQC = **PR**
Silv. Syst. = **CC**
Alteration = **7.5%**
Avg. PAR = **0.57**
Rank = **15**/49
n = **96**



Slide 36

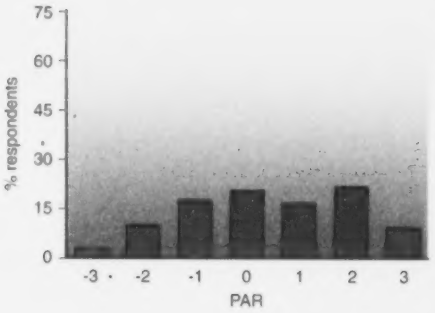
VQC = **PR**
Silv. Syst. = **CC**
Alteration = **0.9%**
Avg. PAR = **0.49**
Rank = **16**/49
n = **95**



Slide 22

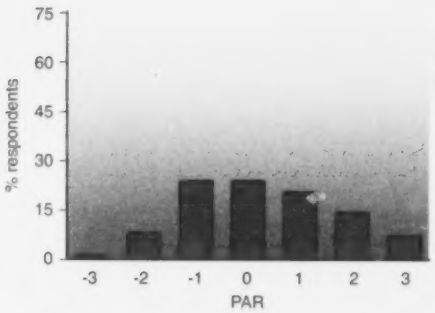
VQC = **PR**
Silv. Syst. = **HL**

Avg. PAR = **0.46**
Rank = **17**/49
n = **96**



Slide 32

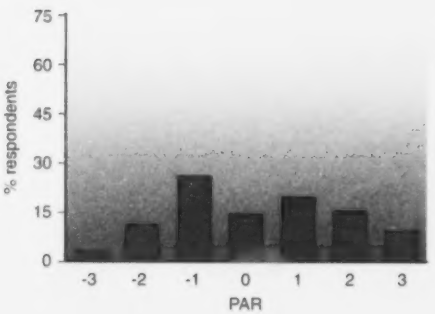
VQC = **PR**
Silv. Syst. = **CC**
Alteration = **2.0%**
Avg. PAR = **0.41**
Rank = **18**/49
n = **96**



Slide 17

VQC = **PR**
Silv. Syst. = **PC**

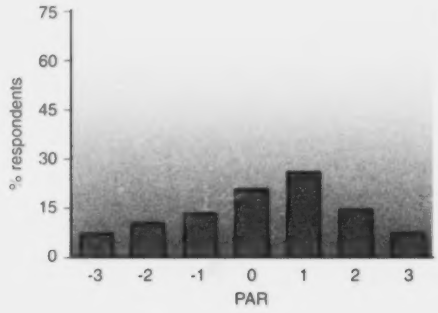
Avg. PAR = **0.28**
Rank = **19**/49
n = **96**



Slide p2

VQC = **R**
Silv. Syst. = **CC**
Alteration = **0.9%**
Avg. PAR = **0.21**
Rank = **20**/49
n = **96**

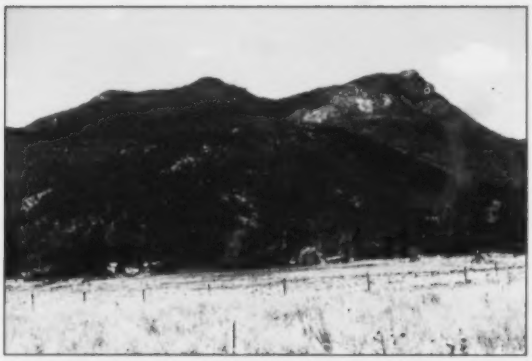
Economic Benefits of Managing Forestry and Tourism at Nimmo Bay

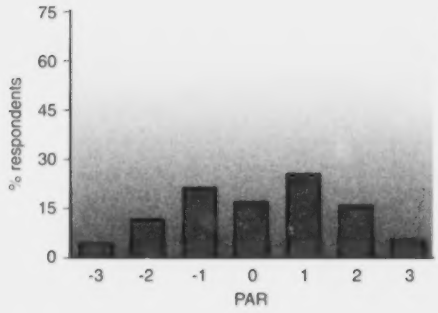


Slide 5

VQC = **PR**
Silv. Syst. = **PC**

Avg. PAR = **0.21**
Rank = **20**/49
n = **96**

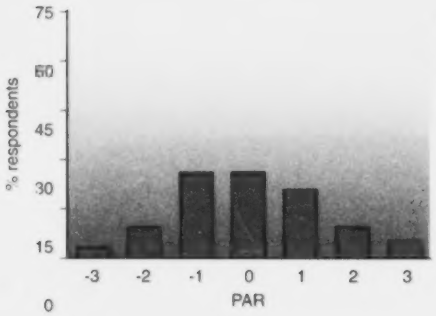




Slide 30

VQC = **R**
Silv. Syst. = **PC**

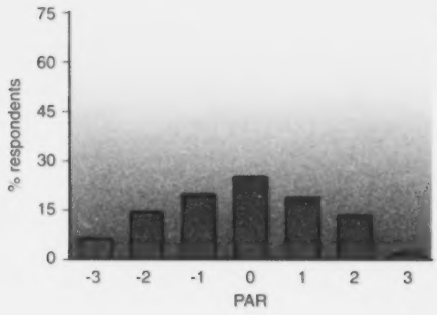
Avg. PAR = **0.16**
Rank = **22**/49
n = **95**



Slide 34

VQC = **M**
Silv. Syst. = **PC**

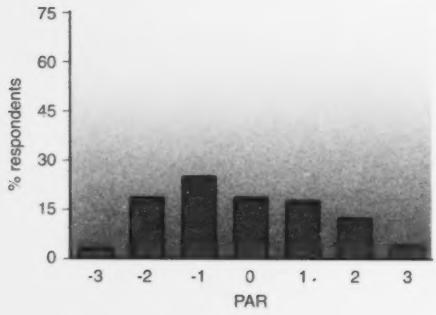
Avg. PAR = **0.01**
Rank = **23**/49
n = **96**



Slide 14

VQC = **M**
Silv. Syst. = **PC**

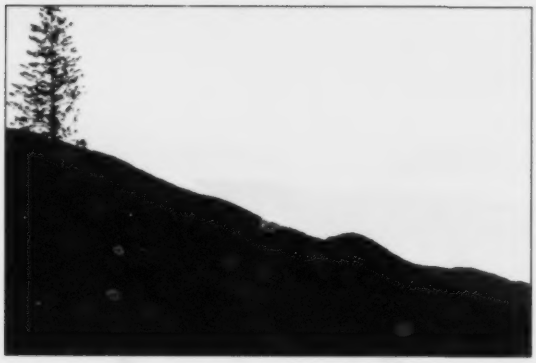
Avg. PAR = **- 0.16**
Rank = **24**/49
n = **96**

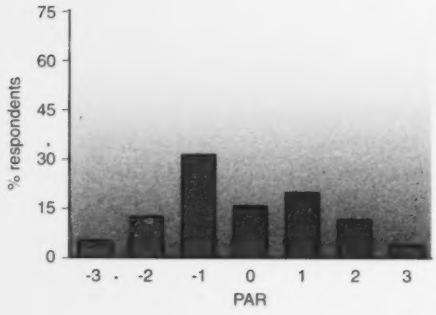


Slide 38

VQC = **PR**
Silv. Syst. = **ND**

Avg. PAR = **- 0.17**
Rank = **25**/49
n = **96**

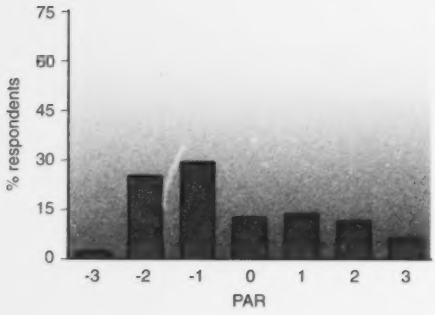




Slide 10

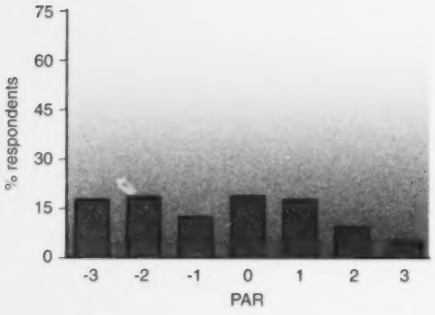
VQC = **M**
Silv. Syst. = **PC**

Avg. PAR = **- 0.17**
Rank = **25**/49
n = **96**



Slide p5

VQC = **PR**
Silv. Syst. = **CC**
Alteration = **5.3%**
Avg. PAR = **- 0.30**
Rank = **27**/49
n = **96**

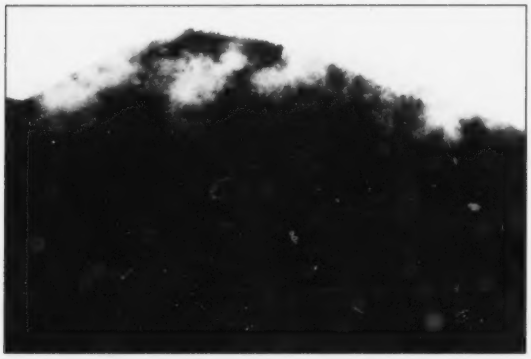


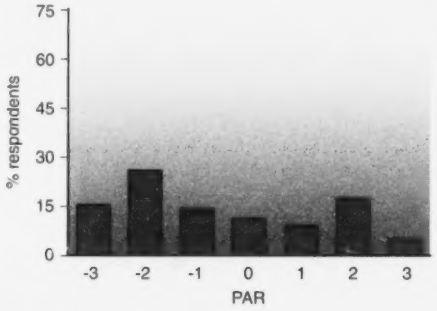
Slide 43

VQC = **PR**
Silv. Syst. = **PC**

Avg. PAR = **- 0.51**
Rank = **28**/49
n = **96**

Economic Benefits of Managing Forestry and Tourism at Nimmo Bay

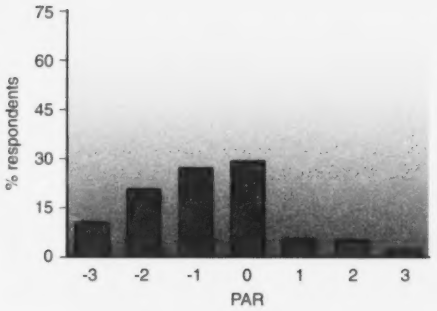




Slide 4

VQC = **P**
Silv. Syst. = **ND**

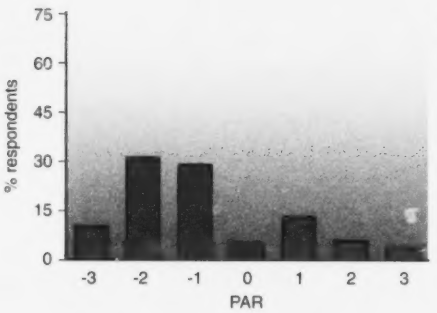
Avg. PAR = **- 0.53**
Rank = **29**/49
n = **96**



Slide 7

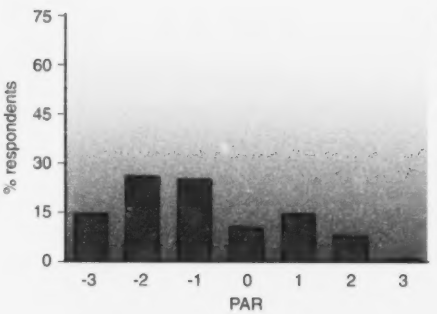
VQC = **PR**
Silv. Syst. = **VR**

Avg. PAR = **- 0.78**
Rank = **30**/49
n = **96**



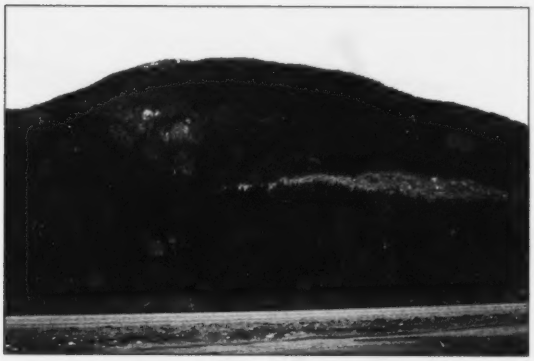
Slide 42

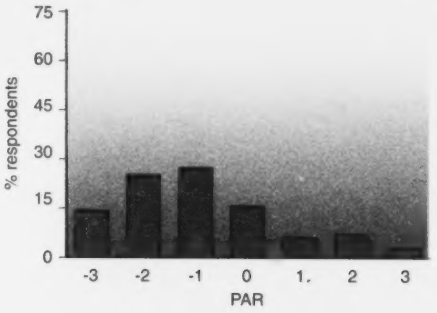
VQC = **PR**
Silv. Syst. = **CC**
Alteration = **6.2%**
Avg. PAR = **- 0.84**
Rank = **31**/49
n = **96**



Slide 40

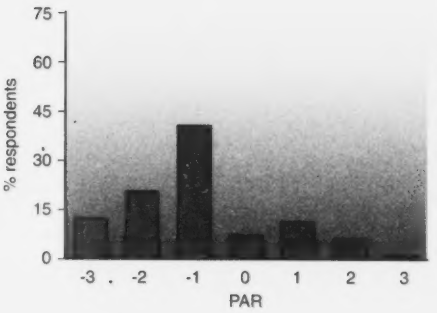
VQC = **PR**
Silv. Syst. = **CC**
Alteration = **0.9%**
Avg. PAR = **- 0.86**
Rank = **32**/49
n = **96**





Slide 2

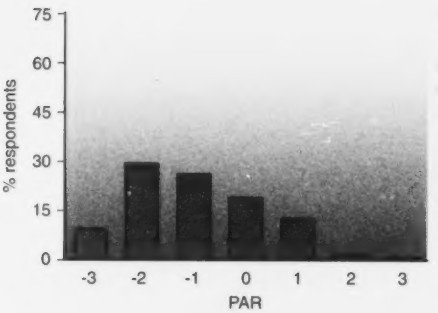
VQC = **PR**
Silv. Syst. = **CC**
Alteration = **3.6%**
Avg. PAR = **- 0.92**
Rank = **33**/49
n = **96**



Slide 15

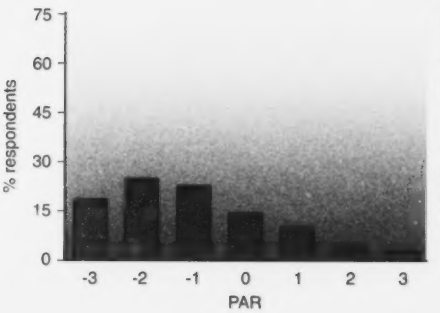
VQC = **M**
Silv. Syst. = **PC**

Avg. PAR = **- 0.93**
Rank = **34**/49
n = **96**



Slide 12

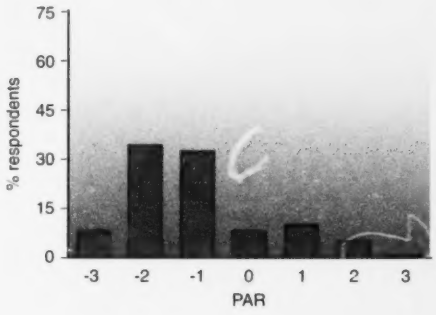
VQC = **M**
Silv. Syst. = **CC**
Alteration = **5.6%**
Avg. PAR = **- 0.94**
Rank = **35**/49
n = **95**



Slide p3

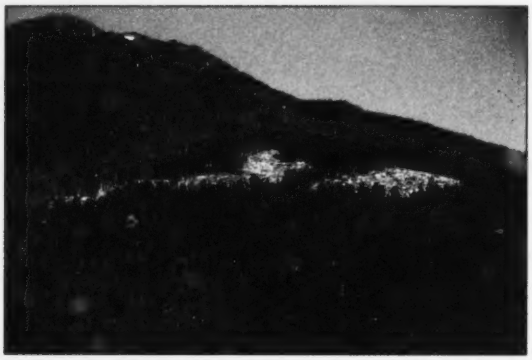
VQC = **M**
Silv. Syst. = **VR**

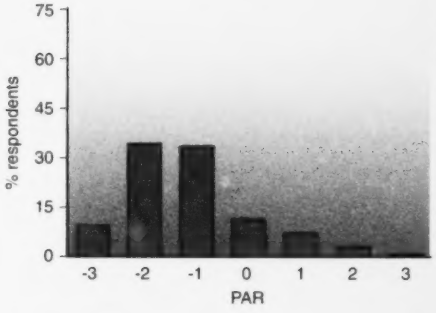
Avg. PAR = **- 0.99**
Rank = **36**/49
n = **96**



Slide 37

VQC = **PR**
Silv. Syst. = **VR**
Alteration = **3.4%**
Avg. PAR = **- 1.02**
Rank = **37**/49
n = **96**

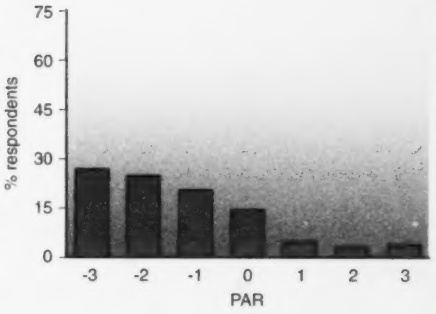




Slide 1

VQC = **PR**
Silv. Syst. = **VR**

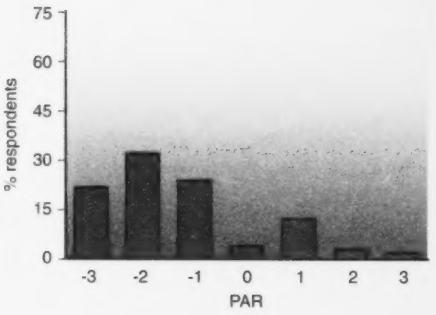
Avg. PAR = **- 1.14**
Rank = **38**/49
n = **96**



Slide 20

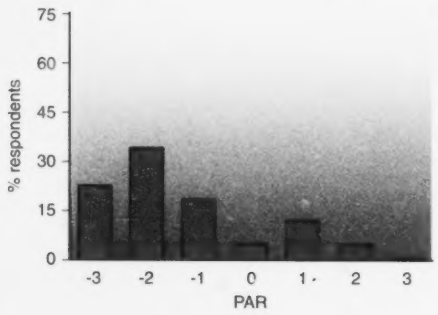
VQC = **M**
Silv. Syst. = **Road**

Avg. PAR = **- 1.28**
Rank = **39**/49
n = **96**



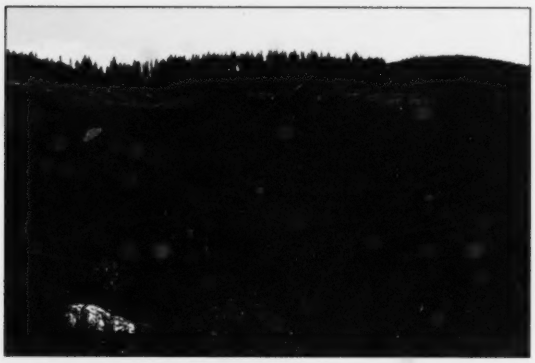
Slide 23

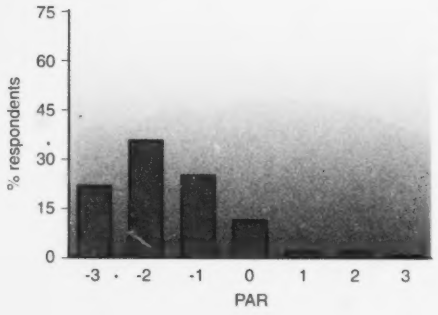
VQC = **M**
Silv. Syst. = **CC**
Alteration = **5.9%**
Avg. PAR = **- 1.29**
Rank = **40**/49
n = **96**



Slide p1

VQC = **M**
Silv. Syst. = **CC**
Alteration = **21.9%**
Avg. PAR = **- 1.30**
Rank = **41**/49
n = **96**

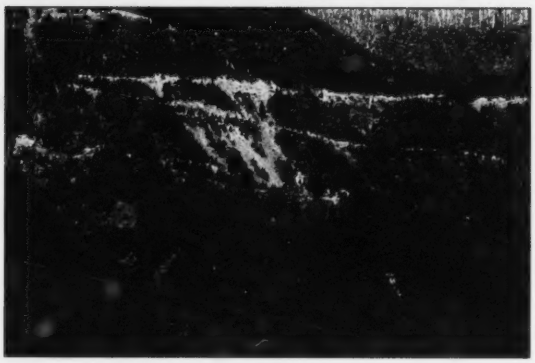


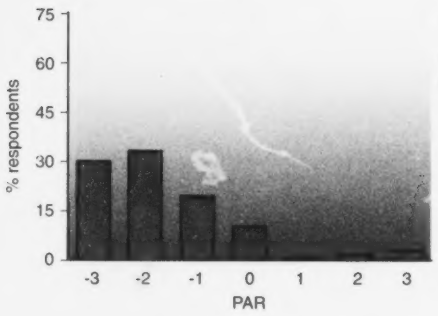


Slide 28

VQC = **M**
Silv. Syst. = **PC**

Avg. PAR = **- 1.54**
Rank = **42**/49
n = **95**

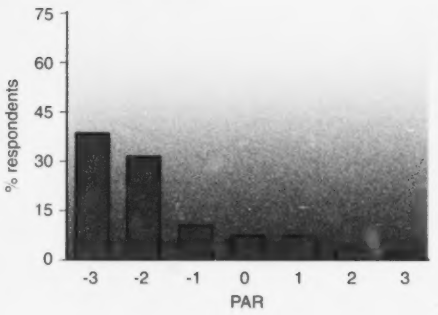




Slide 21

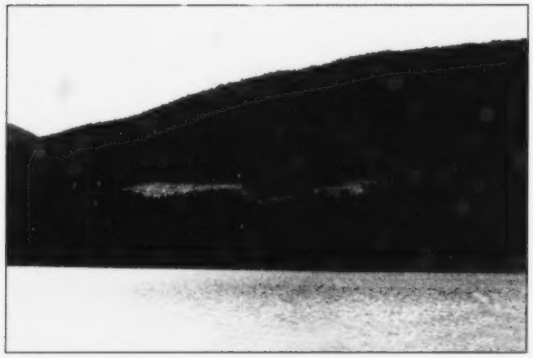
VQC = **M**
Silv. Syst. = **Road**

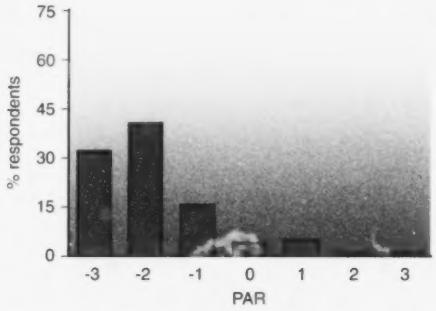
Avg. PAR = **- 1.63**
Rank = **43**/49
n = **96**



Slide 16

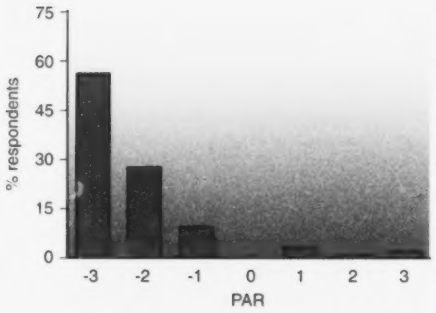
VQC = **M**
Silv. Syst. = **CC**
Alteration = **5.7%**
Avg. PAR = **- 1.69**
Rank = **44**/49
n = **96**





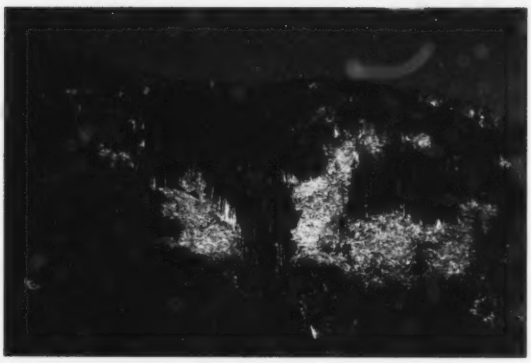
Slide 33

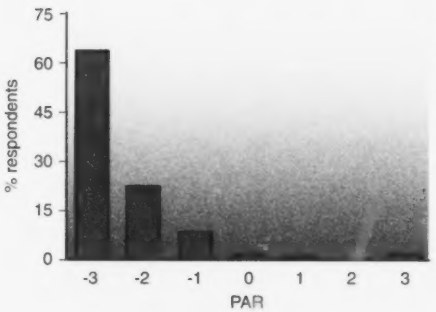
VQC = **PR**
Silv. Syst. = **CC**
Alteration = **2.8%**
Avg. PAR = **- 1.83**
Rank = **45**/49
n = **96**



Slide 29

VQC = **M**
Silv. Syst. = **CC**
Alteration = **12.0%**
Avg. PAR = **- 2.22**
Rank = **46**/49
n = **94**

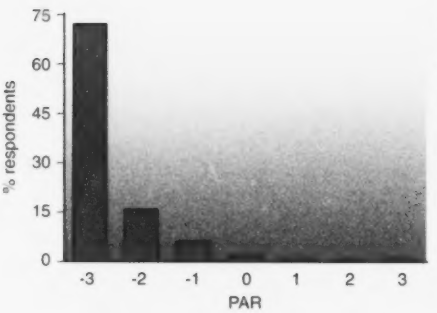




Slide 19

VQC = **M**
Silv. Syst. = **VR**

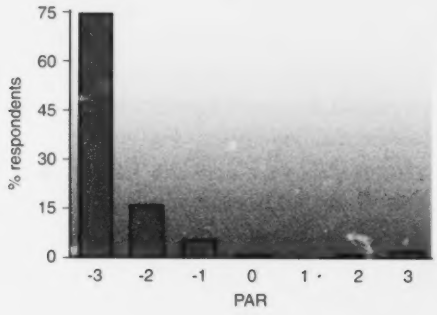
Avg. PAR = **- 2.37**
Rank = **47**/49
n = **94**



Slide 9

VQC = **M**
Silv. Syst. = **VR**

Avg. PAR = **- 2.49**
Rank = **48**/49
n = **94**



Slide 24

VQC = **M**
Silv. Syst. = **CC/SD**

Avg. PAR = **- 2.52**
Rank = **49**/49
n = **94**

Appendix 5 Preferences of demographic groups

Table A5.1 summarizes the preferences of different demographic groups and the overall preferences of participants in the Nimmo Bay survey. For each pair of silvicultural systems (ND vs. PC, PC vs. CC, etc.) or EVC classes (P vs. R, R vs. PR, etc.), the Table lists the number of pairs of slides that were compared to determine individual preferences (first row), the mean preference (percentage of pairs with first slide rated higher than second) for all respondents in the group, and the corresponding standard error (given below the mean). The results of an ANOVA (Kruskal-Wallis test) of demographic differences are summarized at the end of each grouping (p values are italicized).

Silvicultural system and EVC preferences did not vary significantly with age, level of education, or size of the respondent's hometown. In contrast, some preferences appear to have been influenced by sex, country of origin, and employment at the resort. Females were significantly more likely than men to score clearcuts higher than variable retention (females rated CC higher than VR for 69% of the CC-VR slide pairings, compared with 64% for males) and were less likely to score retention higher than modification (86% vs. 90%). Partial cuts were preferred over clearcuts more often by British Columbia residents than visitors from other Canadian provinces or the United States (69% vs. 64%). Visitors from the United Kingdom showed no significant preference for either silvicultural system (56% does not differ significantly from 50%). Resort employees appear to have been less likely than guests to prefer clearcuts over variable retention (61% vs. 67%), more likely to prefer partial cuts over clearcuts (69% vs. 63%), and more likely to prefer retention over partial cuts (78% vs. 73%).

Overall preferences (Table A5.1, second to last row) were consistent with the trends in average PAR (Figures 12 and 13). Natural disturbances and partial cuts were strongly preferred over variable retention (ND and PC rated higher for >80% of the slide pairs); preservation and retention were strongly preferred over modification (P and R rated higher for >85% of the slide pairs); and respondents showed no significant preference for preservation over retention (P rated higher than R for 55% of the slide pairs).

Table A5.1. Silvicultural system and EVC preferences of demographic groups (percent slide pairs where first slide was rated higher than the second).[a]

	Silvicultural Systems						EVC					
	ND			PC		CC	P			R		PR
	PC	CC	VR	CC	VR	VR	R	PR	M	PR	M	M
Number of slide pairs	80	108	36	270	90	108	50	90	80	180	160	288
Sex												
Female (32)	**62.3**	**70.8**	**87.9**	**61.7**	**82.6**	**69.2**	**53.9**	**72.7**	**84.7**	**71.7**	**85.9**	**69.9**
	2.5	2.1	1.4	2.6	1.6	2.0	2.7	2.0	1.8	1.9	1.9	1.6
Male (60)	**62.0**	**73.0**	**85.3**	**65.4**	**81.0**	**64.4**	**55.2**	**74.2**	**87.2**	**75.2**	**90.1**	**72.5**
	1.8	1.4	1.2	1.2	1.3	1.1	2.0	1.6	1.2	1.0	1.0	1.0
	0.92	*0.36*	*0.18*	*0.13*	*0.45*	*0.02*	*0.69*	*0.56*	*0.24*	*0.07*	*0.03*	*0.16*
Prob (ANOVA)	*64*	*53*	*93*	*90*	*18*	*67*	*66*	*03*	*66*	*63*	*14*	*56*
	0.88	*0.44*	*0.17*	*0.46*	*0.53*	*0.03*	*0.73*	*0.51*	*0.24*	*0.11*	*0.04*	*0.13*
Prob (Kruskal-Wallis)	*91*	*57*	*25*	*31*	*30*	*47*	*98*	*45*	*92*	*35*	*86*	*78*
Age												
Under 20 (10)	**68.1**	**75.1**	**89.0**	**59.2**	**74.5**	**65.1**	**58.9**	**78.5**	**91.3**	**73.2**	**88.4**	**67.7**
	5.1	4.8	3.3	2.5	4.2	3.7	6.0	4.5	3.7	1.7	2.1	3.0
20 - 29 (18)	**63.8**	**71.9**	**86.1**	**62.3**	**80.5**	**67.6**	**52.9**	**72.2**	**85.7**	**73.8**	**89.2**	**72.6**
	3.1	2.6	2.7	2.5	3.0	2.2	3.6	3.2	2.8	2.0	2.6	2.1
30 - 39 (17)	**62.4**	**76.2**	**86.5**	**69.1**	**81.7**	**59.9**	**55.7**	**76.2**	**89.3**	**76.8**	**93.0**	**74.8**
	3.0	2.0	1.8	2.4	1.7	2.3	3.8	2.1	1.6	1.7	1.1	1.7
40 - 49 (18)	**62.9**	**70.4**	**87.2**	**61.6**	**82.7**	**68.9**	**54.0**	**72.9**	**84.9**	**75.0**	**87.9**	**70.7**
	3.0	2.9	2.1	3.0	2.4	1.9	3.7	2.8	2.3	2.2	2.6	2.0
50 - 59 (22)	**59.2**	**69.0**	**83.8**	**63.5**	**82.6**	**67.5**	**55.3**	**71.5**	**83.7**	**70.6**	**86.0**	**71.5**
	3.3	2.3	1.6	2.8	1.5	2.2	3.3	2.6	1.8	2.2	2.0	1.6
60 - 69 (7)	**56.8**	**73.5**	**87.1**	**70.2**	**87.4**	**67.7**	**53.2**	**73.7**	**87.5**	**75.5**	**88.1**	**69.3**
	5.3	3.9	2.5	3.3	2.3	3.5	5.1	4.4	2.8	5.5	2.2	4.0
Over 69 (9)	**54.4**	**74.3**	**91.0**	**68.9**	**87.2**	**69.2**	**53.0**	**71.9**	**84.7**	**68.5**	**85.2**	**74.0**
	14.4	10.9	6.3	2.4	2.8	1.6	9.0	10.8	14.7	2.6	10.5	12.7
	0.58	*0.53*	*0.74*	*0.17*	*0.17*	*0.13*	*0.97*	*0.75*	*0.39*	*0.45*	*0.38*	*0.47*
Prob (ANOVA)	*06*	*40*	*78*	*06*	*85*	*98*	*95*	*55*	*39*	*04*	*83*	*76*
	0.54	*0.33*	*0.42*	*0.20*	*0.22*	*0.14*	*0.92*	*0.57*	*0.10*	*0.26*	*0.11*	*0.53*
Prob (Kruskal-Wallis)	*53*	*42*	*28*	*03*	*43*	*34*	*06*	*35*	*77*	*61*	*11*	*97*
Highest level of education												
Elementary school (6)	**60.2**	**68.1**	**83.3**	**60.6**	**80.0**	**68.6**	**55.6**	**71.1**	**86.8**	**69.2**	**89.5**	**70.1**
	6.4	6.9	4.7	2.6	3.2	5.2	9.8	5.8	5.7	3.1	3.2	3.5
High school (9)	**71.2**	**77.3**	**91.7**	**58.9**	**74.5**	**64.5**	**61.1**	**81.2**	**92.3**	**74.5**	**86.4**	**66.5**
	5.3	3.9	2.6	2.9	4.9	1.9	5.8	4.8	3.4	1.7	2.1	2.5
College/technical diploma (12)	**61.0**	**71.7**	**86.8**	**63.1**	**80.4**	**66.1**	**56.8**	**72.7**	**84.2**	**70.0**	**86.0**	**72.9**
	4.1	4.2	1.4	4.6	2.7	3.7	4.4	3.5	3.0	3.4	2.5	1.8
Bachelors (48)	**61.9**	**71.8**	**86.0**	**63.9**	**82.2**	**66.6**	**53.7**	**72.4**	**86.4**	**73.3**	**88.9**	**72.9**
	1.8	1.4	1.3	1.7	1.4	1.4	2.0	1.6	1.3	1.3	1.6	1.3
Masters/PhD (19)	**59.2**	**72.7**	**85.3**	**68.7**	**85.0**	**65.4**	**53.3**	**74.9**	**84.9**	**78.5**	**90.3**	**70.6**
	3.5	2.4	2.2	1.8	1.9	2.1	3.6	2.6	2.1	1.6	1.2	1.9
	0.30	*0.60*	*0.37*	*0.21*	*0.11*	*0.93*	*0.71*	*0.32*	*0.36*	*0.05*	*0.68*	*0.26*
Prob (ANOVA)	*26*	*14*	*31*	*88*	*54*	*77*	*67*	*51*	*30*	*94*	*67*	*94*
	0.32	*0.58*	*0.32*	*0.10*	*0.17*	*0.94*	*0.34*	*0.23*	*0.14*	*0.06*	*0.28*	*0.22*
Prob (Kruskal-Wallis)	*31*	*36*	*60*	*01*	*08*	*76*	*22*	*70*	*03*	*88*	*54*	*07*

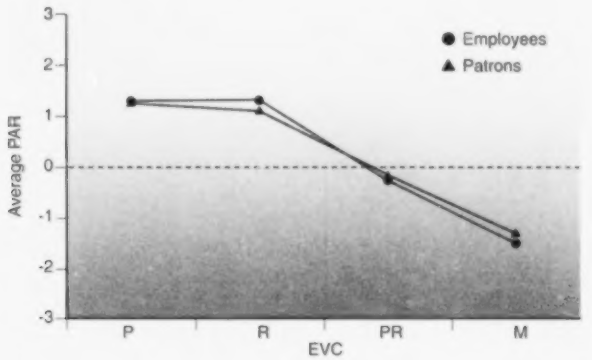
Continued

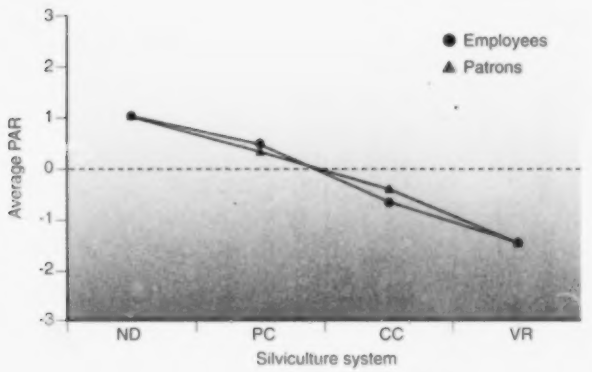
a Sample means are given in boldface, standard errors are given below each mean, and p-values for comparing demographic subsets are given in italics.

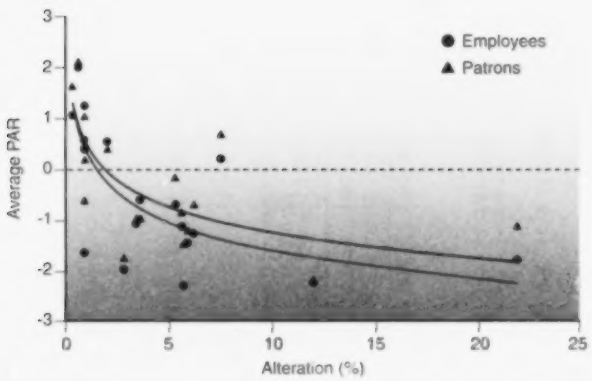
Table A5.1. continued

	Silvicultural systems						EVC					
	ND			PC		CC	P			R		PR
	PC	CC	VR	CC	VR	VR	R	PR	M	PR	M	M
Location of hometown												
BC (20)	**62.1**	**76.1**	**85.7**	**68.8**	**81.1**	**59.6**	**55.7**	**76.1**	**89.1**	**76.2**	**89.7**	**72.0**
	3.7	2.4	2.1	2.6	2.2	1.5	3.8	3.0	1.8	1.8	2.0	1.8
Other Province (14)	**60.2**	**73.4**	**88.0**	**63.8**	**78.7**	**65.4**	**54.8**	**75.2**	**86.8**	**69.7**	**84.0**	**69.1**
	4.1	2.2	2.4	3.6	3.2	3.0	3.9	2.7	2.6	2.9	3.2	2.7
USA (49)	**62.1**	**71.5**	**86.2**	**63.9**	**82.9**	**67.7**	**53.7**	**72.6**	**85.9**	**75.1**	**90.1**	**73.0**
	1.7	1.4	1.2	1.3	1.3	1.3	2.0	1.5	1.3	1.1	1.1	1.2
UK (10)	**64.2**	**66.9**	**86.3**	**56.5**	**81.6**	**73.8**	**57.4**	**71.8**	**82.6**	**70.1**	**86.8**	**68.1**
	5.2	6.0	3.2	4.5	3.4	3.4	6.3	5.6	4.7	3.5	2.8	2.4
	0.92	*0.18*	*0.90*	*0.04*	*0.54*	*0.00*	*0.89*	*0.63*	*0.35*	*0.06*	*0.12*	*0.23*
Prob (ANOVA)	*54*	*30*	*16*	*51*	*58*	*07*	*91*	*38*	*42*	*95*	*68*	*18*
	0.86	*0.24*	*0.87*	*0.02*	*0.56*	*0.00*	*0.67*	*0.61*	*0.54*	*0.08*	*0.18*	*0.14*
Prob (Kruskal-Wallis)	*40*	*03*	*15*	*47*	*61*	*05*	*99*	*99*	*89*	*96*	*90*	*32*
Population of hometown												
Rural: <2500 (17)	**62.9**	**68.8**	**85.9**	**58.5**	**80.4**	**70.3**	**55.8**	**72.9**	**82.5**	**71.1**	**85.4**	**68.5**
	3.4	3.4	1.9	3.4	2.6	2.6	3.9	3.3	2.9	2.4	2.6	2.2
Town: 2500-24 999 (24)	**65.7**	**74.9**	**90.0**	**64.2**	**85.3**	**69.1**	**56.9**	**76.8**	**89.2**	**77.5**	**92.0**	**72.7**
	2.5	1.8	1.3	1.8	1.3	1.5	2.9	2.0	1.5	1.7	1.1	1.5
City: 25 000-249 999 (16)	**61.1**	**72.0**	**83.9**	**64.3**	**78.7**	**62.1**	**52.8**	**71.0**	**85.1**	**73.1**	**87.7**	**71.8**
	3.9	2.8	2.9	2.5	3.4	2.4	3.9	2.8	2.8	2.3	2.8	2.5
Large city: >250 000 (36)	**59.7**	**72.3**	**85.3**	**66.7**	**81.4**	**64.3**	**53.5**	**73.0**	**86.9**	**73.3**	**88.6**	**72.4**
	2.4	1.9	1.5	1.9	1.5	1.7	2.7	2.1	1.5	1.4	1.4	1.4
	0.43	*0.41*	*0.11*	*0.11*	*0.18*	*0.02*	*0.79*	*0.45*	*0.16*	*0.12*	*0.12*	*0.40*
Prob (ANOVA)	*37*	*02*	*51*	*10*	*58*	*51*	*25*	*32*	*97*	*91*	*15*	*19*
	0.30	*0.76*	*0.08*	*0.18*	*0.28*	*0.03*	*0.78*	*0.44*	*0.29*	*0.10*	*0.11*	*0.43*
Prob (Kruskal-Wallis)	*20*	*15*	*59*	*50*	*94*	*55*	*45*	*62*	*88*	*37*	*68*	*67*
Employee												
Yes (21)	**60.4**	**74.7**	**85.8**	**69.3**	**82.5**	**61.1**	**53.6**	**75.1**	**88.1**	**77.5**	**91.6**	**73.4**
	3.1	1.7	1.6	2.0	1.7	1.9	3.2	2.5	1.7	1.6	1.1	1.2
No (75)	**62.2**	**71.5**	**86.2**	**62.9**	**81.5**	**67.4**	**55.0**	**73.2**	**86.0**	**73.0**	**88.0**	**71.2**
	1.6	1.4	1.1	1.3	1.2	1.1	1.8	1.4	1.2	1.1	1.1	1.0
	0.60	*0.25*	*0.84*	*0.02*	*0.68*	*0.00*	*0.73*	*0.53*	*0.38*	*0.04*	*0.10*	*0.28*
Prob (ANOVA)	*50*	*90*	*91*	*09*	*31*	*96*	*12*	*26*	*37*	*39*	*60*	*44*
	0.58	*0.31*	*0.70*	*0.02*	*0.84*	*0.00*	*0.52*	*0.76*	*0.64*	*0.03*	*0.14*	*0.31*
Prob (Kruskal-Wallis)	*87*	*86*	*25*	*07*	*53*	*85*	*61*	*99*	*48*	*56*	*35*	*87*
All respondents	61.8	72.2	86.1	64.3	81.7	66.0	54.7	73.6	86.4	74.0	88.8	71.7
	1.4	1.1	0.9	1.2	1.0	1.0	1.6	1.2	1.0	0.9	0.9	0.9

Appendix 6 Comparative analysis of Nimmo Bay employees vs. patrons







There appears to be very little difference between employee perceptions and those of the lodge patrons. Where there are differences, employees rated modification scenes slightly lower and retention scenes slightly higher. They rated partial cutting scenes higher and clearcuts lower. Their threshold for percent alteration was slightly less at 1.4 vs. 1.8.

Appendix 7 Estimates used in economic analysis

Table A7.1 Resource value estimates, linear assumption

	Threshold[a]	Uncon-strained[b]	Modification -50	Modification -25	Modification -10	Partial retention -25	Partial retention -10	Partial retention	Retention	No harvest
Timber volume (m^3)	14 250	7 283	6 150	6 150	6,150	3,010	3,010	3,010	356	-
Lodge guests	-	-	250	375	450	375	450	500	500	500
Change in lodge costs			-50%	-25%	-10%	-25%	-10%	0%		0%
At discount rate 5.0% ($)										
Timber	4 587 059	2 344 390	1 979 678	1 979 678	1 979 678	968 916	968 916	968 916	114 596	-
Lodge	-	-	2 293 047	3 439 570	4 127 484	3 439 570	4 127 484	4 586 093	4 586 093	4 586 093
Total	4 587 059	2 344 390	4 272 725	5 419 248	6 107 162	4 408 486	5 096 400	5 555 009	4 700 689	4 586 093
At discount rate 10.0% ($)										
Timber	3 133 651	1 601 571	1 352 418	1 352 418	1 352 418	661 915	661 915	661 915	78 286	-
Lodge	-	-	1 566 496	2 349 744	2 819 692	2 349 744	2 819 692	3 132 991	3 132 991	3 132 991
Total	3 133 651	1 601 571	2 918 914	3 702 161	4 172 110	3 011 659	3 481 607	3 794 907	3 211 278	3 132 991

a Threshold indicates the level of harvest at which forestry would exceed the maximum lodge values.

b Unconstrained is the maximum potential harvest from the area under no visual objective constraints.

Appendix 7 *continued*

Table A7.2 Business revenue estimates, linear assumption

	Threshold	Uncon-strained	Modification -50	Modification -25	Modification -10	Partial retention -25	Partial retention -10	Partial retention	Retention	No harvest
Timber volume (m^3)	17 250	7 283	6 150	6 150	6 150	3 010	3 010	3 010	356	-
Lodge guests	-	-	250	375	450	375	450	500	500	500
At interest rate 5.0% ($)										
Timber	40 829 846	17 238 479	14 556 728	14 556 728	14 556 728	7 124 512	7 124 512	7 124 512	842 633	-
Lodge	-	-	20 251 092	30 376 638	36 451 965	30 376 638	36 451 965	40 502 184	40 502 184	40 502 184
Total	40 829 846	17 238 479	34 807 820	44 933 366	51 008 693	37 501 150	43 576 478	47 626 696	41 344 817	40 502 184
At interest rate 10.0% ($)										
Timber	27 892 636	11 776 352	9 944 331	9 944 331	9 944 331	4 867 063	4 867 063	4 867 063	575 639	-
Lodge	-	-	13 834 541	20 751 812	24 902 174	20 751 812	24 902 174	27 669 082	27 669 082	27 669 082
Total	27 892 925	11 776 474	23 778 975	30 696 246	34 846 608	25 618 925	29 769 287	32 536 195	28 244 727	27 669 082
At forestry value of shipments = $140.00 ($)										
Timber	30 096 238	12 706 719	10 729 963	10 729 963	10 729 963	5 251 575	5 251 575	5 251 575	621 117	-
Lodge	-	-	20 251 092	30 376 638	36 451 965	30 376 638	36 451 965	40 502 184	40 502 184	40 502 184
Total	30 096 238	12 706 719	30 981 055	41 106 601	47 181 928	35 628 213	41 703 541	45 753 759	41 123 300	40 502 184

Table A7.3 Government revenue estimates, linear assumption

	Threshold	Uncon-strained	Modification -50	Modification -25	Modification -10	Partial retention -25	Partial retention -10	Partial retention	Retention	No harvest
Timber volume (m^3)	8 500	7 283	6 150	6 150	6 150	3 010	3 010	3 010	356	-
Lodge guests	-	-	250	375	450	375	450	500	500	500
At interest rate 5.0% ($)										
Timber	3 768 572	3 049 613	2 575 191	2 575 191	2 575 191	1 260 378	1 260 378	1 260 378	149 068	-
Lodge	-	-	1 757 172	2 635 757	3 162 909	2 635 757	3 162 909	3 514 343	3 514 343	3 514 343
Total	3 768 572	3 049 613	4 332 363	5 210 949	5 738 100	3 896 136	4 423 287	4 774 721	3 663 411	3 514 343
At interest rate 10.0% ($)										
Timber	2 574 502	2 083 344	1 759 243	1 759 243	1 759 243	861 028	861 028	861 028	101 836	-
Lodge	-	-	1 200 412	1 800 619	2 160 742	1 800 619	2 160 742	2 400 825	2 400 825	2 400 825
Total	2 574 502	2 083 344	2 959 655	3 559 862	3 919 985	2 661 647	3 021 770	3 261 853	2 502 661	2 400 825

Appendix 7 *continued*

Table A7.4 Employment and income economic impacts, linear assumption

	Threshold	Uncon-strained	Modification -50	Modification -25	Modification -10	Partial retention -25	Partial retention -10	Partial retention	Retention	No harvest
Timber volume (m^3)	27 500	7 283	6 150	6 150	6 150	3 010	3 010	3 010	356	-
Lodge guests		-	250	375	450	375	450	500	500	500
Employment (person years)										
For. L & FS	12.4	3.3	2.8	2.8	2.8	1.4	1.4	1.4	0.2	-
For. Process.	16.0	4.2	3.6	3.6	3.6	1.7	1.7	1.7	0.2	-
Lodge	0.0	-	6.0	9.0	10.8	9.0	10.8	12.0	12.0	12.0
Total less process.	12.4	3.3	8.8	11.8	13.6	10.4	12.2	13.4	12.2	12.0
Total with processing	28.3	7.5	12.3	15.3	17.1	12.1	13.9	15.1	12.4	12.0
Income ($)										
Income L&FS	606 660	160 666	135 671	135 671	135 671	66 402	66 402	66 402	7 853	-
Income Processing	736 890	195 155	164 795	164 795	164 795	80 656	80 656	80 656	9 539	-
Lodge income	-	-	400 626	600 939	721 127	600 939	721 127	801 252	801 252	801 252
Total less processing	606 660	160 666	536 297	736 610	856 798	667 341	787 528	867 654	809 105	801 252
Total with processing	1 343 550	355 821	701 093	901 406	1 021 593	747 997	868 184	948 310	818 645	801 252

Appendix 7 *continued*

Table A7.5 Resource value estimates, linear assumption - 10 and 30 years time lines

	Threshold	Uncon-strained	Modification -50	Modification -25	Modification -10	Partial retention -25	Partial retention -10	Partial retention	Retention	No harvest
Timber volume (m^3)	16 500	7 283	6 150	6 150	6 150	3 010	3 010	3 010	356	-
Lodge guests	-	-	250	375	450	375	450	500	500	500
Change in lodge costs			-50%	-25%	-10%	-25%	-10%	0%		
At discount rate 5%. Timelines: 30 years forestry, 10 years lodge ($)										
Timber	6 551 662	2 891 864	2 441 983	2 441 983	2 441 983	1 195 182	1 195 182	1 195 182	141 373	-
Lodge	-	-	1 420 799	2 131 199	2 557 439	2 131 199	2 557 439	2 841 598	2 841 598	2 841 598
Total	6 551 662	2 891 864	3 862 782	4 573 182	4 999 422	3 326 381	3 752 621	4 036 780	2 982 972	2 841 598
At discount rate 5%. Timelines: 10 years forestry, 30 years lodge ($)										
Timber	3 290 965	1 452 612	1 226 632	1 226 632	1 226 632	600 352	600 352	600 352	71 013	-
Lodge	-	-	2 828 531	4 242 796	5 091 356	4 242 796	5 091 356	5 657 062	5 657 062	5 657 062
Total	3 290 965	1 452 612	4 055 163	5 469 429	6 317 988	4 843 148	5 691 708	6 257 414	5 728 075	5 657 062
At discount rate 10%. Timelines: 30 years forestry, 10 years lodge ($)										
Timber	4 017 704	1 773 390	1 497 508	1 497 508	1 497 508	732 927	732 927	732 927	-	-
Lodge	-	-	1 130 600	1 695 901	2 035 081	1 695 901	2 035 081	2 261 201	2 261 201	2 261 201
Total	4 017 704	1 773 390	2 628 108	3 193 408	3 532 588	2 428 827	2 768 007	2 994 127	2 261 201	2 261 201
At discount rate 10%. Timelines: 10 years forestry, 30 years lodge ($)										
Timber	2 618 784	1 155 915	976 092	976 092	976 092	477 730	477 730	477 730	-	-
Lodge	-	-	1 734 552	2 601 828	3 122 194	2 601 828	3 122 194	3 469 105	3 469 105	3 469 105
Total	2 618 784	1 155 915	2 710 644	3 577 921	4 098 286	3 079 558	3 599 924	3 946 834	3 469 105	3 469 105

Appendix 7 *continued*

Table A7.6 *Resource value estimates, non-linear assumption*

	Threshold	Uncon-strained	Modification -50	Modification -25	Modification -10	Partial retention -25	Partial retention -10	Partial retention	Retention	No harvest
Timber volume (m^3)	14 500	7 283	6 150	6 150	6 150	3 010	3 010	3 010	356	0
Lodge guests	0	0	250	375	450	375	450	500	500	500
Change in lodge costs			-25%	-15%	-5%	-15%	-5%	0%		
At interest rate 5.0% ($)										
Timber	4 667 534	2 344 390	1 979 678	1 979 678	1 979 678	968 916	968 916	968 916	114 596	0
Lodge	0	0	-5 673 421	252 983	2 534 190	252 983	2 534 190	4 586 093	4 586 093	4 586 093
Total	4 667 534	2 344 390	-3 693 743	2 232 661	4 513 869	1 221 899	3 503 106	5 555 009	4 700 689	4 586 093
At interest rate 10.0% ($)										
Timber	3 188 628	1 601 571	1 352 418	1 352 418	1 352 418	661 915	661 915	661 915	78 286	0
Lodge	0	0	-3 875 800	172 825	1 731 233	172 825	1 731 233	3 132 991	3 132 991	3 132 991
Total	3 188 628	1 601 571	-2 523 382	1 525 243	3 083 651	834 740	2 393 148	3 794 907	3 211 278	3 132 991

Table A7.7 *Business revenue estimates, non-linear assumption*

	Threshold	Uncon-strained	Modification -50	Modification -25	Modification -10	Partial retention -25	Partial retention -10	Partial retention	Retention	No harvest
Timber volume (m^3)	17 500	7 283	6 150	6 150	6 150	3 010	3 010	3 010	356	0
Lodge guests	0	0	250	375	450	375	450	500	500	500
Change in lodge costs			0	0	0	0	0	0		
At interest rate 5.0% ($)										
Timber	41 421 583	17 238 479	14 566 728	14 566 728	14 566 728	7 124 512	7 124 512	7 124 512	811 888	0
Lodge	0	0	20 251 092	30 376 638	36 451 965	30 376 638	36 451 965	40 502 184	40 502 184	40 502 184
Total	41 421 583	17 238 479	34 807 820	44 993 366	51 008 693	37 501 150	43 576 478	47 626 696	41 344 817	40 502 184
At interest rate 10.0% ($)										
Timber	28 297 170	11 776 474	9 994 434	9 994 434	9 994 434	4 867 113	4 867 113	4 867 113	554 642	0
Lodge	0	0	13 834 541	20 751 812	24 902 174	20 751 812	24 902 174	27 669 082	27 669 082	27 669 082
Total	28 297 170	11 776 474	23 778 975	30 696 246	34 846 608	25 618 925	29 769 287	32 536 195	28 244 727	27 669 082

Appendix 7 *continued*

Table A7.8 Government revenue estimates, non-linear assumption

	Threshold	Uncon-strained	Modification -50	Modification -25	Modification -10	Partial retention -25	Partial retention -10	Partial retention	Retention	No harvest
Timber volume (m^3)	8 500	7 283	6 150	6 150	6 150	3 010	3 010	3 010	356	0
Lodge guests	0	0	250	375	450	375	450	500	500	500
Change in lodge costs			0	0	0	0	0	0		
At interest rate 5.0% ($)										
Timber	3 559 207	3 049 613	2 575 191	2 575 191	2 575 191	1 260 378	1 260 378	1 260 378	149 068	0
Lodge	0	0	2 635 757	2 987 192	3 338 626	2 987 204	3 338 626	3 514 343	3 514 343	3 514 343
Total	3 559 207	3 049 613	5 210 949	5 562 383	5 913 817	4 247 582	4 599 004	4 774 721	3 663 411	3 514 343
At interest rate 10.0% ($)										
Timber	2 431 474	2 083 344	1 759 243	1 759 243	1 759 243	861 028	861 028	861 028	101 836	0
Lodge	0	0	1 800 619	2 040 701	2 280 784	2 040 710	2 280 784	2 400 825	2 400 825	2 400 825
Total	2 431 474	2 083 344	3 559 862	3 799 944	4 040 027	2 901 738	3 141 812	3 261 853	2 502 661	2 400 825

Table A7.9 Employment and income economic impact, non-linear assumption

	Threshold	Uncon-strained	Modification -50	Modification -25	Modification -10	Partial retention -25	Partial retention -10	Partial retention	Retention	No harvest
Timber volume (m^3)	27 500	7 283	6 150	6 150	6 150	3 010	3 010	3 010	356	0
Lodge guests	0	0	250	375	450	375	450	500	500	500
Change in lodge costs			0	0	0	0	0	0		
Employment (person years)										
For. L & FS	12.4	3.3	2.8	2.8	2.8	1.4	1.4	1.4	0.2	0.0
For. Processing	16.0	4.2	3.6	3.6	3.6	1.7	1.7	1.7	0.2	0.0
Lodge	0.0	0.0	9.0	10.2	11.4	10.2	11.4	12.0	12.0	12.0
Total less processing	12.4	3.3	11.8	13.0	14.2	11.6	12.8	13.4	12.2	12.0
Total with processing	28.3	7.5	15.3	16.5	17.7	13.3	14.5	15.1	12.4	12.0
Income ($)										
Income L&FS	606 660	160 666	135 671	135 671	135 671	66 402	66 402	66 402	7 853	0
Income Process.	736 890	195 155	164 795	164 795	164 795	80 656	80 656	80 656	9 539	0
Lodge income	0	0	600 939	681 064	761 189	681 064	761 189	801 252	801 252	801 252
Total less processing	606 660	160 666	736 610	816 735	896 861	747 466	827 591	867 654	809 105	801 252
Total with processing	1 343 550	355 821	901 406	981 531	1 061 656	828 122	908 247	948 310	818 645	801 252

Appendix 7 *continued*

Table A7.10 Resource value estimates, linear assumption - limited lodge view only

	Threshold	Uncon-strained	Modification -50	Modification -25	Modification -10	Partial retention -25	Partial retention -10	Partial retention	Retention	No harvest
Timber volume (m^3)	14 250	2 390	2 017	2 017	2 017	1 500	978	978	116	-
Lodge guests	-	-	250	375	450	375	450	500	500	500
Change in lodge costs			-50%	-25%	-10%	-25%	-10%	0%		0%
At discount rate 5.0% ($)										
Timber	4 587 059	769 338	649 270	649 270	649 270	314 656	314 656	314 656	37 244	-
Lodge	-	-	2 293 047	3 439 570	4 127 484	3 439 570	4 127 484	4 586 093	4 586 093	4 586 093
Total	4 587 059	769 338	2 942 317	4 088 840	4 776 754	3 754 226	4 442 140	4 900 750	4 623 337	4 586 093
At discount rate 10.0% ($)										
Timber	3 133 651	525 574	443 549	443 549	443 549	214 957	214 957	214 957	25 443	-
Lodge	-	-	1 566 496	2 349 744	2 819 692	2 349 744	2 819 692	3 132 991	3 132 991	3 132 991
Total	3 133 651	525 574	2 010 045	2 793 293	3 263 241	2 564 701	3 034 650	3 347 949	3 158 434	3 132 991

Table A7.11 Business revenue estimates, linear assumption - limited lodge view only

	Threshold	Uncon-strained	Modification -50	Modification -25	Modification -10	Partial retention -25	Partial retention -10	Partial retention	Retention	No harvest
Timber volume (m^3)	17 750	7 283	2 017	2 017	2 017	978	978	978	116	-
Lodge guests	-	-	250	375	450	375	450	500	500	500
At interest rate 5.0% ($)										
Timber	40 829 846	17 238 479	4 774 133	4 774 133	4 774 133	2 313 691	2 313 691	2 313 691	273 856	-
Lodge	-	-	20 251 092	30 376 638	36 451 965	30 376 638	36 451 965	40 502 184	40 502 184	40 502 184
Total	40 829 846	17 238 479	25 025 225	35 150 771	41 226 099	32 690 329	38 765 657	42 815 875	40 776 039	40 502 184
At interest rate 10.0% ($)										
Timber	27 892 925	11 776 474	3 261 451	3 261 451	3 261 451	1 580 599	1 580 599	1 580 599	187 085	-
Lodge	-	-	13 834 541	20 751 812	24 902 174	20 751 812	24 902 174	27 669 082	27 669 082	27 669 082
Total	27 892 925	11 776 474	17 095 992	24 013 263	28 163 625	22 332 411	26 482 773	29 249 681	27 856 167	27 669 082
At forestry value of shipments = $140.00 ($)										
Timber	30 968 593	12 706 719	3 519 079	3 519 079	3 519 079	1,705,453	1 705 453	1 705 453	201 863	-
Lodge	-	-	20 251 092	30 376 638	36 451 965	30 376 638	36 451 965	40 502 184	40 502 184	40 502 184
Total	30 968 593	12 706 719	23 770 171	33 895 717	39 971 044	32 082 091	38 157 419	42 207 637	40 704 046	40 502 184

Appendix 7 *concluded*

Table A7.12 Government revenue estimates, linear assumption - limited lodge view only

	Threshold	Uncon-strained	Modification -50	Modification -25	Modification -10	Partial retention -25	Partial retention -10	Partial retention	Retention	No harvest
Timber volume (m^3)	17 750	7 283	2 017	2 017	2 017	978	978	978	116	-
Lodge guests	-	-	250	375	450	375	450	500	500	500
At interest rate 5.0% ($)										
Timber	3 559 207	1 000 765	844 579	844 579	844 579	409 309	409 309	409 309	48 447	-
Lodge	-	-	1 757 172	2 635 757	3 162 909	2 635 757	3 162 909	3 514 343	3 514 343	3 514 343
Total	3 559 207	1 000 765	2 601 751	3 480 336	4 007 488	3 045 066	3 572 218	3 923 652	3 562 790	3 514 343
At interest rate 10.0% ($)										
Timber	2 431 474	683 673	576 974	576 974	576 974	279 619	279 619	279 619	33 097	-
Lodge	-	-	1 200 412	1 800 619	2 160 742	1 800 619	2 160 742	2 400 825	2 400 825	2 400 825
Total	2 431 474	683 673	1 777 387	2 377 593	2 737 717	2 080 238	2 440 362	2 680 444	2 433 922	2 400 825

Table A7.13 Employment and income economic impacts, linear assumption - limited lodge view only

	Threshold	Uncon-strained	Modification -50	Modification -25	Modification -10	Partial retention -25	Partial retention -10	Partial retention	Retention	No harvest
Timber volume (m^3)	25 000	7 283	2 017	2 017	2 017	978	978	978	116	-
Lodge guests		-	250	375	450	375	450	500	500	500
Employment (person years)										
For. L & FS	11.3	1.1	0.9	0.9	0.9	0.4	0.4	0.4	0.1	-
For. Processing	14.5	1.4	1.2	1.2	1.2	0.6	0.6	0.6	0.1	-
Lodge	-	-	6.0	9.0	10.8	9.0	10.8	12.0	12.0	12.0
Total less processing	11.3	1.1	6.9	9.9	11.7	9.4	11.2	12.4	12.1	12.0
Total with processing	25.8	2.5	8.1	11.1	12.9	10.0	11.8	13.0	12.1	12.0
Income ($)										
Income L&FS	551 509	52 724	44 496	44 496	44 496	21 564	21 564	21 564	2 552	-
Income Process.	669 900	64 042	54 048	54 048	54 048	26 193	26 193	26 193	3 100	-
Lodge income	-	-	400 625	600 938	721 125	600 938	721 125	801 250	801 250	801 250
Total less processing	551 509	52 724	445 121	645 433	765 621	622 501	742 689	822 814	803 802	801 250
Total with processing	1 221 409	116 767	499 168	699 481	819 668	648 695	768 882	849 007	806 903	801 250

QP4500085679